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NATIONAL BUREAU OF STANDARDS AUTHORIZATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

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ON

NATIONAL BUREAU OF STANDARDS AUTHORIZATION

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CONTENTS

	Page
Opening statement by Senator Gorton	1
Opening statement by Senator Hollings	2
Opening statement by Senator Heflin	2

LIST OF WITNESSES

Ambler, Dr. Ernest, Director, National Bureau of Standards, accompanied by Raymond G. Kammer, Deputy Director; Donald R. Johnson, Acting Director, National Engineering Laboratory; and James H. Burrows, Director, Institute for Computer Sciences and Technology	3
Prepared statements:	
Dr. Ambler	11
Dr. Merrifield	15
Mr. Caponio	17
Biddle, A. G. W., on behalf of the Computer Communications Industry Association	40
Prepared statement	45
Bland, Richard, former chairman, National Fire Prevention and Control Commission	34
Prepared statement	36
Dresselhaus, Dr. Mildred S., Center for Materials Science and Engineering, Massachusetts Institute of Technology	18
Prepared statement	25

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

Blauman, Sheldon, chairman, Network Users Association, letter of February 12, 1983	57
Cady, Sheldon H., executive vice president, Mineral Insulation Manufacturers Association, letter of March 3, 1983	65
Davis, Hilton, vice president, legislative and political affairs, U.S. Chamber of Commerce, letter of March 4, 1983	66
Dryden, Robert L., president, Boeing Computer Services Co., letter of February 21, 1983	64
Feeser, Dr. Larry, chairman, technical activities committee, American Society of Civil Engineers, statement	51
Hawkins, Jasper S., chairman of the board, National Institute of Building Sciences, letter of February 21, 1983	62
Keithley, Carter, executive director, Wood Heating Alliance, letter of February 16, 1983	59
National Fire Protection Association, statement	52
Quinn, Carl, vice president, Simco Electronics, letter of February 7, 1983	56
Reene, Charles W., executive vice president, Washington affairs, Portland Cement Association, letter of March 8, 1983	67
Rhodes, J. M., Factory Mutual Research, letter of February 10, 1983	57
Simon, Dr. Dorothy M., vice president, research, Avco Corp., letter of February 16, 1983	59
Society of Fire Protection Engineers, statement	54

NATIONAL BUREAU OF STANDARDS AUTHORIZATION

TUESDAY, FEBRUARY 22, 1983

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:31 a.m., in room SR-263, Russell Senate Office Building, Hon. Slade Gorton (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Cheryl Coodley, staff counsel; and Edward A. Smick, minority professional staff member.

OPENING STATEMENT BY SENATOR GORTON

Senator GORTON. The meeting of the Science, Technology, and Space Subcommittee will come to order.

Welcome to our hearing this morning on the authorization for the National Bureau of Standards. We appreciate the participation of our witnesses, especially those who have traveled from other parts of the United States to assist us in this budgetary process.

The National Bureau of Standards is an agency with an extremely broad mission relevant to nearly every national problem area and economic sector. Many of us take for granted the measures, standards, and technologies developed at NBS which affect us daily. For example: The neon tube was first demonstrated at NBS. NBS first made it possible for radios to operate on household current; the first large-scale computer in the United States was designed and built at NBS; and the performance standards for flammability of children's sleepwear and for residential smoke detectors were developed by NBS scientists.

In fact, of particular interest to my home State, Washington, the Center for Applied Mathematics at NBS recently developed several models for more efficient and economical fishery management for the Washington State salmon fisheries along the Columbia River. These models continue to provide us an intelligent basis for management of this precious and scarce natural resource.

We will examine closely the proposed budget for fiscal year 1984 for the NBS. There are substantial budget changes, notably in the National Engineering Laboratory and the Institute for Computer Sciences and Technology. We will scrutinize carefully those proposed changes, assess their impact on the overall mission of the Bureau and make our own recommendations with respect to the budget for NBS for fiscal year 1984.

We will also receive testimony today on the administration's proposed legislation to establish a revolving fund for the National Technical Information Service and authorization for a one-time appropriation of $5 million for this fund. This fund would allow NTIS to modernize its financial practices and generally improve management control over its operations.

We are most interested in receiving input from each of our witnesses on these issues.

At this point Senator Goldwater is here with me. Do you have any opening statement?

Senator GOLDWATER. I am waiting to hear.

Senator GORTON. All right. Senators Hollings and Heflin have opening statements which, without objection, will be included in the record at this point.

[The statements follow:]

OPENING STATEMENT BY SENATOR HOLLINGS

Mr. Chairman, you know that I am deeply committed to budgetary restraint and that I have urged on the President and the Congress a freeze on government spending increases and further tax cuts as the first step in the process. Such a freeze spreads the burden of the nation's economic hardship on all its quarter of a billion people, rich and poor alike. Now we heard just a few short weeks ago from the President that his 1984 budget would, in fact, be characterized by equitable sharing among government agencies and all segments of the public in the restraints needed to attain budgetary sanity.

Today we are convened to review the 1984 budget authorization for the National Bureau of Standards. And what do we see? We see one, if not the very oldest, of our government's scientific research and engineering establishments confronted with a 20 percent reduction in its budget in one fiscal year. We see two important centers in that Bureau totally eliminated, and a third cut by 70 percent. This surely must be one of the strangest manifestations of evenhandedness that any of us has yet seen from this Administration.

Mr. Chairman, I cannot in good faith claim to know or understand the details underlying the judgment of the Administration in its proposed fiscal year 1984 budget for the Bureau. I can only hope that the testimony to be presented today will provide the understanding that will enable our Committee to act responsibly and make sure that this fine national resource is properly funded so it can competently fulfill the mandate of this Congress and the forty Congresses that have preceded us since the National Bureau of Standards was first authorized.

OPENING STATEMENT BY SENATOR HEFLIN

Mr. Chairman, the National Bureau of Standards is the federal government's oldest scientific research agency. Through the years the Bureau has played a vital role in the advancement of science and technology in our society. It operates some of the finest laboratories staffed with outstanding scientists and engineers. They are engaged in programs having a direct linkage with a broad spectrum of industry. Many of those programs contribute to advances in industrial productivity—one of the most crucial needs of our nation.

The Administration has proposed a 20 percent reduction in the Bureau's budget for fiscal year 1984. This includes the elimination of several important activities including very important and innovative work in advanced metals processing technology. This committee, and indeed the Congress, has for several years urged the allocation of at least $3 million for that program, but we never seem to achieve that level of support.

It is the responsibility of this subcommittee to insure that any cutbacks in the Bureau do not severely diminish the important activities for which it is responsible.

I will be listening with interest and concern to this morning's testimony.

Thank you, Mr. Chairman.

Senator GORTON. We will begin with the Director of the National Bureau of Standards, Dr. Ernest Ambler. Dr. Ambler, you may proceed.

STATEMENT OF DR. ERNEST AMBLER, DIRECTOR, NATIONAL BUREAU OF STANDARDS, ACCOMPANIED BY RAYMOND G. KAMMER, DEPUTY DIRECTOR; DONALD R. JOHNSON, ACTING DIRECTOR; NATIONAL MEASUREMENT LABORATORY; JOHN W. LYONS, DIRECTOR, NATIONAL ENGINEERING LABORATORY; AND JAMES H. BURROWS, DIRECTOR, INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY

Dr. AMBLER. Thank you, Mr. Chairman. I propose to summarize my written statement and ask that it be included in the record, with your permission.

Senator GORTON. It will be included in the record, without objection.

Dr. AMBLER. I am accompanied by several members of my senior management. I would like quickly to introduce them. This is Mr. Kammer, who is the Deputy Director; Mr. Burrows, who is head of the Institute for Computer Sciences and Technology; Dr. Lyons, who is head of the National Engineering Laboratory; and Dr. Johnson, who is head of the National Measurement Laboratory.

The primary role of the National Bureau of Standards, Mr. Chairman, is to be the Nation's primary central laboratory for measurement science. NBS also responds to specific legislative assignments and the needs of other Government agencies. Work under the Standard Reference Data Act is an example of a legislative assignment. Our work with the Department of Defense to tie defense operational calibrations to the national standards is an example of work for other Government agencies.

NBS contributes to the solution of technological problems in areas identified by the Congress and the administration as being of great national importance. We are, for example, now pursuing programs in semiconductor electronics, metals processing and automated manufacturing, as discussed at some length in my written statement.

With regard to our budget, in fiscal year 1983, the current fiscal year, NBS is operating under the continuing resolution at a level of $117,861,000. We estimate that our reimbursable work will total approximately $70.5 million.

For fiscal year 1984, we are requesting a total appropriation of $98,700,000. This comprises a $5.9 million cost-of-living increase and $25.1 million in program decreases. This includes $48.7 million for measurement research and standards; $18.5 million for engineering measurements and standards; $3 million for computer science and technology; $12.4 million for core measurement research for new technologies; $7.7 million for the technical competence fund; and $8.4 million for central technical support.

In your letter of invitation, Mr. Chairman, for these hearings you asked that I address the question of continued fulfillment of the mission of the National Bureau of Standards in light of the proposed budget changes. With the funding recommended in the budget, the National Bureau of Standards will emphasize measure-

ment standards, data and test methods. We will continue to work on a number of nationally important programs, particularly in automated manufacturing, electronics, and materials.

I will discuss the major changes. A decrease totaling $9.1 million reflects a proposal to eliminate the Center for Building Technology and the Center for Fire Research and supports the administration's position that the private sector and State and local governments should take a greater role in supporting these programs.

A $7 million decrease is proposed for the Institute for Computer Sciences and Technology. The remaining $3 million will enable NBS, first, to concentrate research efforts on local area networks, second, to continue to modify and adapt for Federal use standards written by private sector organizations, and, third, to monitor development of national and international voluntary standards.

A reduction of $3.2 million is proposed as a result of fee increases for programs that provide services, such as calibrations, training, and materials, to identifiable users. These programs will continue to the extent that users are willing to bear developmental costs as well as servicing costs.

As part of the user fee package, a provision is included in the draft authorization bill submitted to the Congress by Secretary Baldrige on February 10 which would allow NBS to use net fee income to replace equipment and inventories at current replacements costs before net fee proceeds are transferred to the general fund of the Treasury.

A one-time savings of $2 million results from the delay in the NBS computer acquisition. The Department has reviewed the computer needs of the National Oceanic and Atmospheric Administration and the National Bureau of Standards, and has directed the establishment of a consolidated computer facility at NBS in Gaithersburg. Planning for this acquisition has begun.

Mr. Chairman, that is a summary of our written statement. I look forward to working with you and this subcommittee and will be pleased to answer any questions you may have.

Senator GORTON. Thank you, Dr. Ambler.

Could you start by explaining the rationale for the administration's decision to turn fire and building research over to the private sector and to State and local governments?

Dr. AMBLER. The feeling of the administration is that these programs are more properly the responsibility of the private sector and State and local governments, Mr. Chairman.

Senator GORTON. Do you think that the private sector or even State and local governments—and let's separate those out into two questions—will carry out research in something like fire without the support of NBS? Who is going to be interested in fire research in the private sector?

Dr. AMBLER. Well, I have not really had the opportunity to explore that to give you a complete answer. I did not really feel free to do that until the President submitted the budget to Congress.

I certainly would look toward organizations such as Underwriters Laboratories and Factory Mutual to do this work.

Senator GORTON. Do you believe that they are likely to take up all of the activities which NBS has undertaken over the last sever-

al years, or are we going to have a slippage in research in this area?

Dr. AMBLER. I do not really know, sir. I would expect, or at least I would hope that they would take up some of it.

Senator GORTON. You would hope that they might take up some of it?

Dr. AMBLER. Yes, sir.

Senator GORTON. Have any of those private agencies or State and local governments supported this decision?

Dr. AMBLER. I really do not know, sir.

Senator GORTON. You have not been contacted by any who have supported the decision?

Dr. AMBLER. I have not, no, sir.

Senator GORTON. In your budget submission and again in your testimony you indicate that user fees for the measurement assurance program, standard reference materials and voluntary lab accreditation programs will be raised to cover fully both the developmental and operating costs. What indication do you have that the user groups for these programs are prepared to pay 100 percent of the increased costs?

Dr. AMBLER. Well, inasmuch as we have not tried to operate the programs in this way, I do not really have any definite information. It is my belief that as far as the programs that are ongoing are concerned the users may be willing to pay the increased fees. As far as new programs, I think we have to wait and see. The developmental costs are fairly substantial.

Senator GORTON. Would it be correct to characterize your testimony in both of the areas about which I have questioned you so far as simply reflecting that of the administration and that it may or may not reflect your own views?

Dr. AMBLER. Mr. Chairman, as a Presidential appointee I feel that I must present the views of the administration in these areas, and that is what I believe I am doing.

Senator GORTON. Thank you.

On another subject, how does the Bureau plan to fulfill its statutory responsibilities under the Brooks Act in light of the proposed budget cuts for the Institute for Computer Sciences and Technology?

Dr. AMBLER. The way that we would do that relates to the way we would deal with the development of Federal information processing standards, which is very central to the Brooks Act. Until this time, we have done a great deal of work ourselves, technical work, in developing the underlying information and in writing the standards.

The difference in approach will be that we will rely on the private sector standards-writing groups, of which there are quite a number, to do this work. We will assist them and review their standards to see whether they then can be adopted as Federal information processing standards.

Senator GORTON. In any event, the Bureau's activities in this respect will be more limited than they have been in the past?

Dr. AMBLER. Yes, sir.

Senator GORTON. Do the activities of ICST and the development of automated data processing standards for Federal procurement purposes result in savings to the Government?

Dr. AMBLER. Yes, sir, I believe they do. I do not have any figures with me, but I am sure we could supply them.

Senator GORTON. But as a general proposition you believe that they do?

Dr. AMBLER. Yes, sir.

Senator GORTON. Will that continue if the Institute's activities are cut back to the point at which they merely adapt the standards which are developed by private industry?

Dr. AMBLER. Well, I think the key thing will be the speed at which we can influence the private sector to do this work.

Senator GORTON. Are you confident you can encourage the private sector with the appropriate degree of speed?

Dr. AMBLER. They have in the past been a little slow, but there is indication there is a greater level of interest in this work than there has been in the past.

Senator GORTON. In your statement you refer to the more active role that you envision for the computer industry in supporting computer sciences as a justification for these budget reductions at the Institute. Have you consulted with the industry to determine whether or not and to what extent it is prepared to take such a role now?

Dr. AMBLER. No, sir.

Senator GORTON. Since 1978, the Institute for Computer Sciences and Technology has had a 5-year plan. Would you discuss the effectiveness of the Institute in meeting the goals of its current 5-year plan and what direction the Institute will take in the future, to the extent that you have not already covered these subjects?

Dr. AMBLER. Yes. There was a 5-year plan that divided the standards that we felt were required into, I think, three categories, and then under each of those categories there was a detailed list of the standards and timetables for their development.

I do not have with me a summary of that plan or of how we have succeeded, but it is available.

Senator GORTON. I think we are more interested in how you will succeed in the balance of the 5-year plan under this budget than we are in what has happened so far.

Dr. AMBLER. I think that again depends on the speed with which the private sector can be persuaded to do the work that has been done by ICST.

Senator GORTON. One specific in this respect, the evaluation panel recommended more attention to the Institute's role as an education clearinghouse. Can you fulfill that role with the budget you have outlined here today?

Dr. AMBLER. No, I do not think so, sir.

Senator GORTON. How does NBS plan to fulfill its statutory responsibilities under the Fire Prevention and Control Act in light of the termination of CFR?

Dr. AMBLER. The proposal is to eliminate congressional funding for this program so we would be conducting no program, and, therefore, would not be responsive to the legislation.

Senator GORTON. Have you sought other agency projects to augment the base funds for applied aspects of the fire program?

Dr. AMBLER. Yes, sir.

Senator GORTON. Would you explain whether or not you have been successful and what you have done in that respect?

Dr. AMBLER. Well, we have been successful. If you are willing, I will in a moment have Dr. Lyons enumerate the kinds of funding that we get, but the question is: Without the direct funding from Congress would it be viable to continue to accept work from other Government agencies by contract?

I have always maintained that this is a very difficult, perhaps even a dangerous thing to do. If you do not have your own flexibility and in-house research base, you can very quickly become a job shop and I do not think the Bureau of Standards should become a job shop.

Senator GORTON. That is the kind of answer I was looking for, Doctor. I thank you.

Are CFR's fire test facilities and instrumentation adequate?

Dr. AMBLER. Yes, sir, on the whole I believe they are.

Senator GORTON. Can they be improved by the use of outside funds?

Dr. AMBLER. Generally, outside funds do not include funding for new facilities. Generally they are contracts to use whatever facilities we have to do the particular kind of work that the other agency is interested in.

Senator GORTON. And a substantial portion of that money comes in that fashion, from outside, does it not, at the present time?

Dr. AMBLER. Of operating funds?

Senator GORTON. Yes.

Dr. AMBLER. I think in the fire program it is $2.3 million, sir.

Senator GORTON. Thank you. Senator Goldwater?

Senator GOLDWATER. I just have one or two questions.

How are you coming on the substitution of the metric system for our present system of measurement?

Dr. AMBLER. Well, the function of the National Bureau of Standards with regard to metric should be distinguished from the responsibility that used to reside in the Metric Board and is now being performed by the Department of Commerce's Office of Productivity, Technology and Innovation. The function of the National Bureau of Standards is to make sure that in every technical aspect measurement systems that are metric are available with the required accuracy and are compatible with those throughout the rest of the world. I think we do that job superbly well.

The relationships that we have with many U.S. companies—these tend to be the high technology companies—are excellent and it is largely through the actions of those companies that the metric system is being adopted.

With regard to the larger question of the acceptance of the metric system by the general populace, that tends to be a little more difficult. The sentiment seems to be not to strongly favor moving quickly on this, and so we do what we can. But we feel that the best contribution we make is in the areas that I just described.

Senator GOLDWATER. Well, we have made some rather quick changes. For example, we substituted the hertz for the cycle. We

substituted the metric measurement with the cycle and then switched to hertz, and there was no great discomfort to the public. We are now measuring air speeds in knots. That has become rather common practice.

Divisions of mach have entered into the common language. I realize these are not as applicable in a daily way as inches and yards and miles, but I wonder if we are ever going to get to the metric system. Do you think we will?

Dr. AMBLER. Well, in everyday life I think it is going to be a slow business. That is my personal opinion. But in places where it is a matter of great economic importance I think that there is movement, sir.

Senator GOLDWATER. Good.

Senator GORTON. Senator Lautenberg?

Senator LAUTENBERG. Thank you, Mr. Chairman.

If I might take a few minutes for a brief statement before I go on to questions——

Senator GORTON. Without objection.

Senator LAUTENBERG. Before I entered this new life of mine, joining the U.S. Senate, I was in the computer services business and I helped develop a very sizable enterprise in providing computer services to business—government as well, but largely to the private sector.

We had an experience that goes back 33 years to this point. The company, when I left it, had 16,000 employees. It was a company that I started with two other people and when I joined the company I was about 2 years late in coming. They had already gone up to five employees. And it is a company that has used a variety of equipment and provides quite an array of services to various industries and, as I said, some to government as well.

So I come at this question with, certainly, a bias, but also an experience that I think is relevant to the kind of review that is going on now, and I would like to make mention of something that developed as our industry, and as our company developed.

Let me step back one pace. My company was called ADP and it is a coincidental reference to the common terminology that we have here—though we had it first. But ADP was not simply a company. It pioneered an industry, an industry that today is credited with over $20 billion of revenues. And when I joined the company, 33 years ago, we were doing $35,000 a year worth of sales.

What I saw in those years of development were many business failures among a group of very small entrepreneuers because they were out on a limb when they made a commitment to a piece of computer equipment. Well, that goes back only 20 years. Our company started using very basic equipment—adding machines, comptometers, and so forth.

People were left out because they made a decision to go with a given type of equipment and then, as technology developed, they were not able to interface at all with other pieces of peripheral equipment that were being developed, and often, if they could interface, it was not economical or efficient.

Frankly, I think it was a problem that at the time perhaps could have been tolerated, but I want to address specifically, Mr. Chairman, the development of the computer industry as we see it now

and as we will be looking at it in the future. I think it is vital that at least there be some sense of direction as to where we are going in terms of the national interest. I do not suggest we take over private sector development or its own decisionmaking in terms of the kinds of product it produces.

But it seems to me terribly wasteful if there is equipment being manufactured or systems being designed which do not have a significant degree of universality. At times my company and others bid to provide the government with service—various branches of government with computer service. This experience leads me to believe that maybe the National Bureau of Standards ought to look for more efficient ways of getting the work done.

When we got a request for a bid, very often the bid specs were defined in such a way that if it was not blue and it was not west of the Mississippi and it was not north of a given line that you almost—and I am exaggerating here, obviously—you could not bid the job.

It did not result, in my view, in better services for our Government, cheaper services, or more efficient services, because it was a specification that said you had to use this kind of equipment and you had to do it in this mode and you had to use that kind of a network and so forth. I think it was harmful. I think it was wasteful, again for the Government as well as industry generally.

So I come back now, Dr. Ambler, to your testimony and the position that you take, somewhat bewildered, I must confess. I know it is difficult—at least it must be difficult—for the Director of an agency, assuming you believe in the functions of that agency, to argue that the budget be cut, particularly in an area such as the computer field that represents a great opportunity for our economic, sociological, and national development and to say that the standards should be set by those in the industry.

Anybody who has had anything to do with the computer field knows very well that for a number of years standards were set by the dominant company in the industry, a very good company. It is a company we did a lot of business with. But they controlled what went out, what was sold and what was bought and no one, almost no one, else could compete.

And when you see what happened in the case of the Xerox Co., a very strong company financially many years ago, when they tried to compete in the acquisition of a computer manufacturing company it cost them $900 million before they were finished.

So when we look at what it takes to compete in the world generally, competing with nations that I think work much more closely in terms of developing a national standard for manufacture and for production of equipment, I think that we would be relinquishing a substantial part of our responsibility if we do not encourage compatability. It seems to me that the budget for the ICST is small to begin with and if it is cut back to $3 million it does not look like you are going to be able to do the job of your Department.

Perhaps some review is what is in order and we might discuss that a little bit. As I understood it, the ICST says that it yielded to Government a 3-to-1 return on its investment in terms of economies in Government procurement. Do you agree with that figure?

Dr. AMBLER. I would have to check the figures, sir.

Senator LAUTENBERG. Well, it is in the material produced by your Department. Do any of your people——

Mr. BURROWS. Yes, sir. That is the conservative effort that comes out of the studies which we have made of procurements which have either taken place or will be taking place using the national standards we have helped to push through the voluntary national activities. We do not set standards on our own.

Senator LAUTENBERG. You create the standard by the fact that the Government is such an enormous customer, right, and conformity is a very desirable thing on the part of suppliers.

Mr. BURROWS. We do create the standard for use in Federal procurement, but I think we are nowhere near as large a percentage of the national market as the governments are in foreign countries. In France it is more like 60 percent; in England it is more like 20. Here in super machines we are 13 percent; in the large class machine——

Senator LAUTENBERG. You mean you may be losing your share of that?

Mr. BURROWS [continuing]. We are 6 percent. On the very small machines, we are 3 percent. The economic effect of the Federal market is not as strong as the commercial, and indeed we do work with commercial users to decide what is most needed for the overall market.

Senator LAUTENBERG. But you do agree that most of that savings was a result of the work done by the National Bureau of Standards and the ICST group in particular?

Mr. BURROWS. Yes, sir.

Senator LAUTENBERG. Well, if you have been able to effect that kind of return, then what is the justification for reducing the ICST's budget further? Is there no opportunity for expanding that return on investment?

Dr. AMBLER. I think the first thing I would like to say there, sir, is that when one is looking at the overall kind of reduction for the Bureau of Standards that we are proposing here, it is not possible for myself, as Director, to make those decisions without some policy guidance, and the policy guidance that we are operating under is that, first of all, there is a great concern on the part of the President to reduce the Federal deficit; second, that when users can be identified they should be charged user fees; and third, which applies to ICST, if the work can be done in the private sector it should be.

That is the reason for proposing the reduction of $7 million in the ICST budget.

Senator LAUTENBERG. "If the work will be done in the private sector," is, I think, a part of that question. I could not agree more that it is important to reduce the deficit, but the President has proposed a 29-percent increase in Defense Department R&D, an 18-percent increase in R&D at the National Science Foundation, a 4-percent increase in NASA's R&D.

And then I have got to ask whether the proposed cut in NBS funding is consistent with that, or is this the only place where we are going to save the deficit? And are we in the process, Dr. Ambler, of abandoning a responsibility? As we reduce the deficit by this sum, are we in some way reducing national opportunity, be-

cause in countries such as France, they consider the computer industry such an essential part of their total opportunity that they have a policy board within the French Government that directs policy?

As a matter of fact, the fellow who heads it is a very good friend of mine. In France, they coordinate all of the computer activity—not dominate, not direct, but coordinate—so that equipment, as systems are being developed and are offered for sale, are compatible and have an opportunity to be used in synchronization with the need.

Now here I think perhaps your view on the functioning of NBS generally and ICST specifically is different from the view one would typically expect from the head of a department, because, the budget reduction we're talking about here, I think is tantamount eventually to abandoning any interface or interjection of a national view on the commercial sector. I think that it is too bad that we are arguing the case differently, that you are asking for a cut and I, as one of this panel, believe that we ought to extend the operation and be funding it more aggressively because I think it is a vital national responsibility.

Mr. Chairman, I have nothing else.

[The statement follows:]

STATEMENT OF DR. ERNEST AMBLER, DIRECTOR, NATIONAL BUREAU OF STANDARDS, DEPARTMENT OF COMMERCE

Mr. Chairman and members of the subcommittee, I am pleased to appear before you today in support of the Administration's request for authorization of appropriations for fiscal year 1984 and 1985 for the programs and activities of the National Bureau of Standards (NBS).

Draft legislation requesting these authorizations was transmitted to the Congress by the Secretary of Commerce on February 10, 1983.

I am accompanied by my Deputy Director, Mr. Raymond G. Kammer; by Dr. Donald R. Johnson, Acting Director of the National Measurement Laboratory; by Dr. John W. Lyons, Director of the National Engineering Laboratory; and by Mr. James H. Burrows, Director of the Institute for Computer Sciences and Technology.

The total amount requested for the National Bureau of Standards for fiscal year 1984 is $98,700,000.

OVERVIEW OF THE NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards was created by the Act of March 3, 1901, (15 U.S.C. 271-278h) known as the NBS Organic Act. That Act sets out the authority under which we provide measurement standards, measurement services, reliable data, test methods, and research in support of the Nation's efforts in commerce, science, and technology. We exercise these functions for the U.S. Government, states, localities, any scientific or educational institution, firm, corporation, or individual both in the U.S. and in friendly countries. This is a very broad statement of our mission.

I find it useful to consider the motivation for creating and supporting the National Bureau of Standards and the contribution NBS makes to the goals of the Department of Commerce as a means of helping to define programs in more specific terms. We support economic recovery, growth, and the competitiveness of the United States in the world economy; and we direct our programs to support science, often in collaboration with other Federal agencies, and as defined by the Administration and Congress.

These driving forces help to define the bounds of the NBS mission and the specific roles that address that mission. First, NBS provides a basis for measurement throughout the U.S. by means of standards, data, and test methods; basis standards such as length and frequency; data such as properties of materials; and test methods such as methods for measuring spreading resistance in a chip of silicon. In essence, we are the central national laboratory for measurement science and are vigorously

pursuing our more traditional research and development in order to provide an expanded range of measurement products and services needed by U.S. industries.

NBS is now pursuing several programs that are designed to supply required standards, data, and test methods. These programs include research on semiconductor electronics, metals processing, and automated manufacturing.

The semiconductor electronics program focuses on very large scale integrated circuits and on a variety of measurements used to characterize these circuits. This work provides quality control tools to the industry and is the technical basis for setting and satisfying product specifications through voluntary standards organizations. Performance of this work requires new measurement science because of the greatly reduced dimensions and vastly increased complexity of these microcircuits. These efforts assist U.S. industries in producing high quality products to meet increasing foreign competition.

The metals processing program is aimed at providing the measurement methods, data, and predictive models needed by the metals industry to foster a more rapid adoption of advanced processing technologies. A major part of the program is the development and dissemination of evaluated alloy phase diagrams which allow the metals industry to investigate the development of new rapidly-solidified alloys. Such alloys represent one group of a range of new materials that will be used at an increasing rate because of better performance characteristics, such as higher strength and corrosion resistance, and because of lower concentrations of scarce or critical alloy materials.

The automated manufacturing program carries out activities which will enable the private sector to make discrete parts to the required accuracy when using fully automated manufacturing systems. We are concentrating on the dimensional measurements needed for an unmanned work station and software to enable microprocessors from different suppliers to communicate with one another. We have made good progress within the past year in establishing our Automated Manufacturing Research Facility and will shortly have two complete manufacturing cells with robots and machining centers available for our research.

A second role for NBS is to respond to specific legislative assignments and the needs of other Government agencies. The Standard Reference Data Act is an example of a legislative assignment, while work with the Department of Defense to tie defense operational calibrations to the national standards is an example of work for other Government agencies.

As part of the 1984 budget process, we have undertaken an extensive review of the programs conducted in this area in terms of adequacy of NBS support, the changing environment and the resulting effects on program requirements, and a critical analysis of Federal versus private sector and state and local government responsibilities. This review has led to the following:

(1) An increase of 97 positions available to NBS to respond to measurement-related work funded by other government and private sector entities,

(2) A determination that the computer industry should take a more active role in supporting computer sciences and technology, and

(3) A determination that the private sector and state and local governments should support fire and building technology research programs.

AUTHORIZATION REQUEST

The enactment of an authorization of appropriations for the activities of NBS is needed for fiscal year 1984 and beyond. On February 10, the Secretary of Commerce submitted draft legislation which would, if enacted, authorize appropriations for NBS and the Office of Productivity, Technology and Innovation for fiscal years 1984 and 1985. A copy of the draft bill, and an accompanying Statement of Purpose and Need, and letters of transmittal to the Speaker of the House and the President of the Senate are attached.

Section 2 of our draft bill, if enacted, would authorize a total NBS appropriation, exclusive of funding for salary adjustments, of $98,700,000 for fiscal year 1984. This includes in section 2(a) $48,709,000 for Measurement Research and Standards; in section 2(b) $18,507,000 for Engineering Measurement and Standards; in section 2(c) $3,000,000 for Computer Science and Technology; in section 2(d) $12,407,000 for Core Measurement Research for New Technologies; in section 2(e) $7,672,000 for the Technical Competence Fund; and in section 2(f) $8,405,000 for Central Technical Support.

Section 3 of our bill authorizes, in addition to those sums authorized in section 2, appropriations to the Secretary of Commerce of $700,000 for fiscal year 1984 and such sums as may be necessary for 1985 to be paid in foreign currencies for ex-

penses incurred by NBS outside the United States in which the Secretary of Treasury determines to be excess to the normal requirements of the United States.

Section 4 authorizes appropriations of $3,752,000 for fiscal year 1984 and such seems as may be necessary for fiscal year 1985 to the Secretary for the activities of the Office of Productivity, Technology, and Innovation. Dr. Bruce Merrifield, Assistant Secretary of Commerce for Productivity, Technology, and Innovation, has provided to this Committee a written statement describing the activities and programs of that Office.

Section 5 of our draft bill provides an authorization of appropriations of such sums as may be necessary for each of fiscal years 1984 and 1985 to make salary adjustments. Section 6 would make appropriations authorized by the bill available for obligation, for expenditure, or for obligation and expenditure for whatever period is so specified in the Act making the appropriation.

Section 7 proposes to amend section 12(f) of the NBS Organic Act to allow net income to be used to replace equipment and inventories before the net sales proceeds are paid into the general fund of the Treasury. Under existing authority, the NBS Working Capital Fund may recover only its original investment in equipment and inventories and not the actual replacement costs. In these times of increasing equipment complexity, current replacement costs often far exceed the original investments. Then, since the recovered amounts are insufficient for replacement of new equipment and inventories at current prices, NBS must request additional appropriations for restoration of the Working Capital Fund in order to maintain its equipment and inventory levels. In the case of Standard Reference Materials (SRMD's), the need for additional appropriations to cover replacement costs could be avoided by raising the SRM sales fees charged. However, at present NBS lacks the authority needed to retain the proceeds from such increases. Section 7 of our proposed bill would provide that authority. The fiscal year 1984 budget reflects this proposal by showing a decrease for transfers to the working capital fund for SRM production.

FISCAL YEAR 1984 BUDGET

The fiscal year 1984 budget is the result of the Administration's careful evaluation of the Bureau's programs and priorities and reflects the resources necessary to provide essential measurement products and services to U.S. industry.

For fiscal year 1983, NBS is operating at an annual rate of $117,861,000 as authorized under the Second Continuing Resolution, Public Law No. 97-377. It is estimated that our reimbursable work will total approximately $70.5 million.

The proposed NBS budget for fiscal year 1984 includes an increase for cost of living and built-in changes of $5,908,000 and decreases totaling $25,069,000 and 179 positions for programs supported by direct appropriation. The net reduction from the fiscal year 1983 level is $19,161,000.

In your letter of invitation for these hearings, you asked that I address the question of continued fulfillment of the mission of NBS in light of the proposed budget changes. With the funding recommended in the budget, NBS will emphasize measurement standards, data, and test methods. We will continue to work on a number of nationally-important programs, particularly in automated manufacturing, electronics, and materials. The budget reductions are summarized as follows.

BUILDING AND FIRE RESEARCH

A decrease totaling $9.1 million reflects a proposal to eliminate the Center for Building Technology and the Center for Fire Research and supports the Administration's position that the private sector and state and local governments should take a greater role in supporting these programs.

INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY

A $7 million decrease is proposed for ICST. The remaining $3 million will enable NBS to (1) concentrate research efforts on local area networks, (2) continue to modify and adapt for Federal use, standards written by private sector organizations, and (3) monitor developments in national and international voluntary standards committees.

USER FEES

The fiscal year 1984 budget proposes a reduction of $3.2 million as a result of fee increases for programs that provide benefits to identifiable users, such as calibrations, training services and materials, and for participation in measurement assur-

ance and laboratory accreditation programs. These programs will continue to the extent that users are willing to bear developmental costs as well as operating costs. This user fee package assumes enactment of the proposed legislation mentioned earlier concerning replacement costs for Standard Reference Materials.

RECYCLED OIL/AUTOMATED MANUFACTURING

Funds totaling $2.6 million are proposed for reduction as a result of completing objectives for the recycled oil program, completing initial equipment acquisitions for the Automated Manufacturing Research Facility (AMRF), and acquiring support for AMRF facility operation from other Federal agencies, primarily the Defense Department, and the private sector. A total of $3.8 million will have been invested in equipment for the AMRF by the end of fiscal year 1983.

NONMETALLIC MATERIALS/CENTRAL PLANNING

A reduction of $1.2 million is possible from the conversion of the Nonmetallic Materials program to reimbursable funding from other agencies and from a lower central planning effort.

COMPUTER ACQUISITION

A one-time savings of $2 million results from the delay in the NBS computer acquisition. The Department has reviewed NOAA and NBS computer needs and has directed the establishment of a consolidated computer facility at NBS in Gaithersburg to meet requirements. While a few administrative details have not yet been resolved, planning for acquisition has begun.

AREAS OF SUBCOMMITTEE INTEREST

I would now like to discuss two areas which have been of special interest to the Members of this Subcommittee. These areas are our research in metals processing and our efforts to upgrade equipment and instrumentation.

METALS PROCESSING

The Metals Processing program is an excellent example of how the Federal Government can act as a focal point for coordinated industry research. The technological advances that can be realized through this program have generated significant interest in the Metals industry with a potential for NBS to gain as many as 20 Industrial Research Associates and guest workers. Additionally, the American Society for Metals (ASM) has pledged more than $4 million by the industry in support of this effort.

During the past year, we completed a new metals processing laboratory which provides research facilities for investigating rapid solidification processes. Rapidly cooled metals with new compositions and microstructural arrangements exhibit unique properties which can be tailored to suit the demands of a specific application. Our growing capability in this area will result in a new understanding of the relationships between processing variables and physical properties such as strength and corrosion resistance.

A substantial effort in developing computer-readable phase diagrams is underway. These diagrams display the behavior of alloys relative to changes in process variables and are important to a variety of jobs such as the design of new alloys for high temperature applications. Over 20 titanium alloy systems, which are of interest for their light weight and high strength, were evaluated this past year. The ASM estimates that the data emanating from this program will save the industry 500 times the costs of compiling the data. This coming year we will complete evaluations of aluminum, iron, and titanium based binary phase diagrams and implement an interactive computer program for the optimization of ternary phase diagrams.

EQUIPMENT REPLACEMENT

In its report last year, this Committee stated that the equipment replacement rate is too low and a significant part of the funds being authorized need to go to replacing obsolete equipment. The rapid increase in sophistication of scientific equipment has shortened the time for which the equipment is useful as a research tool and has increased its replacement cost. This effect, together with that of inflation, has made the solution to this problem more imperative. We are making progress.

In order to maintain the purchasing power of the working capital fund, the equipment base has been increased over the last few years. In fiscal year 1981 the general equipment funding base was $7.1 million; in fiscal year 1982 the base was $8.1 million; and in fiscal year 1983 the base is $9.7 million. With the addition of special purpose or nondepreciable equipment, the total equipment expenditure, expressed as a percentage of the total NBS budget, including other agency income, will be 8.7 percent for 1983. This level of equipment support falls within the range of that provided to similar research laboratories in the private sector. In addition, we have made substantial changes in the allocation schemes and in the depreciation periods for the acquisition of large equipment items. This is now leading to a more efficient use of the available funding.

In conclusion, I look forward to working with this Subcommittee in the future. I will be pleased to answer any questions you many have.

Attachments.

STATEMENT OF DR. D. BRUCE MERRIFIELD, ASSISTANT SECRETARY OF COMMERCE FOR PRODUCTIVITY, TECHNOLOGY, AND INNOVATION, DEPARTMENT OF COMMERCE

Mr. Chairman and Members of the Subcommittee, I am pleased to submit this statement for the record of the Subcommittee's hearings on the draft bill transmitted to the Congress by the Secretary of Commerce on February 10, 1983, which would authorize, for fiscal years 1984 and 1985, appropriations for the Office of Productivity, Technology and Innovation (OPTI) and the National Bureau of Standards (NBS). My statement is limited to section 4 of that bill, which would authorize appropriations for OPTI. Dr. Ambler, the Director of NBS, is testifying in Support of the rest of the bill, which pertains to NBS.

The authorization requested for OPTI is $3,752,000 for FY 1984 and such sums as may be necessary for fiscal year 1985.

A primary goal of OPTI is to stimulate increased productivity and new product development by the private sector without direct Government intervention. The authorization requested for OPTI reflects that goal. It is up to the private sector to carry out the technological developments and productivity enhancements needed to improve its competitiveness in world markets. The mission of OPTI is to examine and seek to modify, where appropriate, Government policies and programs that influence the climate within which the private sector must accomplish these tasks. For example, OPTI is identifying and working to remove barriers that impede private sector initiatives, and is devising and recommending policies and methods to provide incentives for private sector action.

This year, OPTI initiated an Industrial Technology Partnership (ITP) program designed to stimulate significantly increased levels of R&D in the U.S. A main focus of this program is to facilitate the greater use by the private sector of R&D limited partnerships. While not joint or cooperative research ventures, these partnerships are designed to foster large-scale R&D efforts that are beyond the risk threshold of any individual company. The use of R&D limited partnerships minimizes antitrust and other legal problems, and also builds on tax incentives already in place that reduce the risks associated with attempting to develop new advanced technologies.

OPTI has developed a draft set of guidelines that explains the details of these partnerships including tax ramifications and how to form them. Properly structured and aided by Economic Recovery Tax Act and other tax incentives, R&D limited partnerships can perform, and provide the means for funding the performances of, R&D needed by our corporations, without our corporations having to fund that R&D from retained earnings, from borrowing, or from new equity. It is expected that a significant increase in total non-Government funding of new technology will result.

OPTI is also stimulating the formation of joint and cooperative R&D activities. OPTI is collecting and dissenminating information to the private sector on foreign cooperative R&D efforts, and on productivity improvement experiences, procedures, and results of foreign and domestic companies. OPTI also is analyzing barriers to joint and cooperative R&D for the Cabinet Council on Legal Policy through a special working group on antitrust issues. In addition, OPTI is analyzing existing tax laws, particularly with respect to R&D, that may limit or create uncertainly in the fast changing world of technology-driven industries.

As part of the ITP program, the Center for the Utilization of Federal Technology (CUFT), established under the authority of the Stevenson-Wydler Technology Innovation Act of 1980, monitors the technology transfer activities of Federal laboratories and disseminates technical information generated by them. CUFT is located at,

and is directly managed by the National Technical Information Service (NTIS). We expect that CUFT will be self-supporting within the next two years.

Of the total requested OPTI authorization of $3,752,000 for FY 1984, $1,000,000 is requested for the ITP Program. This represents a fiscal year 1984 reduction of $1,000,000 from the $2,000,000 appropriated for fiscal year 1983. In fiscal year 1983, $1,000,000 is allocated for start-up costs and for supportive efforts associated with identification and clarification tax and antitrust policy and for generation and analyis of industry data in selected technical areas. This expenditure will not be necessary in FY 1984. Other ITP program activities will not be reduced.

Another important OPTI acitivity is that of productivity improvement. $1,030,000 of the requested OPTI authorization of $3,752,000 is for this and related activities. Labor costs are only one factor among many in the productivity performance of individual firms. Other factors contribute as well to what is termed "total factor productivity." To assist individual firms in assessing their progress toward improved productivity, an OPTI goal is the development of quantitative methods of measuring total factor productivity. Other assistance to individual firms will include providing information on best practice methodology. In addition, OPTI will identify barriers to productivity and recommend remedies for consideration by Cabinet Councils and advisory bodies such as the National Productivity Advisory Committee. The President has announced that he will establish a Commission on Industrial Competitiveness and that, in accordance with the White House Conference on Productivity will be conducted later this year. OPTI is providing information and analytic support for these efforts.

Another activity area of OPTI, for which $484,000 of the requested authorization is allocated, is patent policy, especially as such policy affects the ability of our industries to be more competitive in world markets. Approximately one-half of total U.S. R&D spending is funded by the Federal Government. The results from Government-funded R&D follow an uncertain path to the private sector, in part because of difficulty in identifying which R&D results offer commercial potential. Proprietary rights also bear on the commercialization issue. OPTI is working on both aspects. OPTI is developing procedures to improve the identification of R&D results that will benefit the private sector. OPTI is also expediting retention of patent rights by the private sector throughout the Government where permitted by the amendments made to the Patent and Trademark laws by Public Law No. 96-517, of which this Subcommittee was so supportive, and by other applicable statutes. Where existing statutes do not permit private sector retention of patent rights, we are supporting legislation which would permit such retention.

We are increasing our efforts to license the use by the private sector of patents owned by the U.S. Government. There is a large backlog of unexploited inventions available for license. $867,000 of our requested fiscal year 1984 authorization is for this licensing activity, an increase of $367,000 over the $500,000 requested for fiscal year 1983. This increase is needed to permit us to issue a greater number of licenses. Further, we expect to enlarge the portfolio being promoted for license by adding counterpart foreign patents and unpatented technological information. Appropriations are necessary to support our patent licensing program because revenue derived from licenses granted must be returned to the Treasury.

One barrier that exists to effective use of developed technology is the lack of a uniform system of measurement. Even though metric measures are becoming more common in the U.S., we still essentially retain our inch-pound system while all but three other countries in the world use the metric system. OPTI is working to remove barriers that may stand in the way of voluntary metric conversion. Also, OPTI supplies information about the metric system to business and the public, and assists, when requested, in the conversion process. $362,000 of our requested authorization is allocated to continue these activities in fiscal year 1984.

Other activities of the Department of Commerce, besides OPTI, report to me. These include a Competitive Assessment Program and a Strategic Resources Program. While these two programs require appropriations, a specific authorization is not required. The Competitive Assessment Program operates under the basic authority of the Secretary of Commerce to conduct economic studies, and the Strategic Resources Program operates under the National Materials and Minerals Policy, Research and Development Act of 1980, which serves as a continuing authorization of appropriations. The vast bulk of activities of the National Technical Information Service, which also reports to me, are operated on a self-sustaining basis. Provided the Technical Information Clearinghouse Fund Act which the Secretary of Commerce transmitted to the Congress on February 16, 1983, is enacted into law, NTIS will be able to continue to maintain a high level of user services. Dr. Joseph Ca-

ponio, Acting Director of NTIS, is submitting a statement for the record in support of that legislation.

I would be happy to answer, in writing, any questions to me that the Subcommittee submits for the record.

STATEMENT OF JOSEPH F. CAPONIO, ACTING DIRECTOR, NATIONAL TECHNICAL INFORMATION SERVICE, U.S. DEPARTMENT OF COMMERCE

Mr. Chairman and members of the subcommittee, thank you for this opportunity to request the enactment of legislation establishing a revolving fund for the National Technical Information Service.

The Act of September 9, 1950 (15 U.S.C. 1151-1157) directs the Secretary of Commerce to establish and maintain within the Department of Commerce a clearinghouse for the collection and dissemination of scientific, technical and engineering information. NTIS was established as a primary operating unit of the Department to serve as that clearinghouse. NTIS makes Federal technological, scientific, economic and engineering information accessible to business, industry, Government, and other interested individuals and organizations. Use of the technological information that NTIS disseminates serves to: improve the economic health and growth of U.S. firms, increase productivity and innovation in the U.S., improve the competitive position of U.S. industry in the world marketplace, and promote the utilization of foreign research and development within the U.S. industrial sectors.

In the conduct of its program, NTIS provides and promotes a full array of products and services designed to permit wider utilization of technology and serves as the primary source for the public sale of Government-sponsored research and engineering reports, research in progress reports, machine-processed data files, and computer programs.

On February 16, 1983 the Secretary of Commerce transmitted to Congress Administration-approved draft legislation to establish a revolving fund to be used by the Secretary of Commerce to carry out all activities of NTIS. This revolving fund will utilize a cost accounting system similar to the system used by private companies. All NTIS expenses would be paid from the fund, and the fund would be reimbursed from sales receipts.

NTIS presently uses a trust fund account to finance its operations. A trust fund has not proven to be adequate because it does not provide working capital to finance operations during low cash-flow periods and it does not permit net earnings to be retained to develop such capital or to purchase capital assets.

NTIS experiences broad fluctuations in cash-flow and no reservoir of working capital exists to finance operations during times of low cash inflow. As a result we must draw upon funds advanced by customers (deposit accounts) to help finance operations during these low cash-flow periods. The Department of Commerce, the Office of Management and Budget (OMB) and the General Accounting Office (GAO) all agree that this practice is undesirable and should be eliminated through the establishment of a revolving fund which would receive a one-time appropriation of working capital to finance inventories and provide support during low cash periods. The draft bill would authorize a one-time appropriation of $5,000,000 to provide a corpus for the fund. This corpus can be thought of as a line of credit. During low cash-flow periods, NTIS would draw upon this capital to finance operations. During high cash-flow periods, this capital would be replenished from revenues. The establishment of a revolving fund also will allow NTIS to modernize its financial practices, assist in matching costs with revenues, allow for more accurate representation of NTIS' overall financial status and generally improve management control over operations.

I will be happy to answer, in writing, any questions to me that the Subcommittee submits for the record.

Senator GORTON. Thank you, Senator Lautenberg. Thank you, Dr. Ambler, and thanks to the others whom you have brought from NBS with you.

Our next witness will be Dr. Dresselhaus from MIT. Doctor, you may proceed. Your entire written statement will be included in the record. We hope you will summarize it for us, as we are on a tight schedule. We appreciate your coming all the way down from Cambridge.

STATEMENT OF DR. MILDRED S. DRESSELHAUS, CENTER FOR MATERIALS SCIENCE AND ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Dr. DRESSELHAUS. Thank you very much. I will try to summarize the main points of my testimony in the allotted 5 minutes.

I have been very much honored by the invitation to appear before this subcommittee to discuss my views on the technical activities of the National Bureau of Standards. I speak here in my capacity as chairman of the evaluation panels for NBS, which, as you know, operate under the auspices of the National Research Council.

My most recent testimony before this subcommittee was delivered on March 17, 1982. I am pleased to have this opportunity to update my earlier remarks. I speak here both as an academic research scientist and as a representative of the 180 members of the various evaluation panels. Both in my previous testimony and in my written testimony I provide a detailed background about the operation of the evaluation panels.

In brief, these 180 panelists provide annually an indepth evaluation of every major program at the Bureau. The one matter of urgency which I will focus on today relates to the drastic cuts in the proposed 1984 budget. These cuts are disastrous for the future of the Bureau. I make a strong plea here that the funding be restored specifically to the four programs enumerated here—the Center for Fire Research, the Center for Building Technology, the Institute for Computer Science and Technology, and the standard reference material and measurement assurance programs.

In this context I would like also to address the urgent issue of staff reductions. Staff reductions during 1979 to 1982 have seriously reduced the effectiveness of the NBS programs, severely restricted the ability of NBS to move into important new areas, and contributed to a serious morale problem. After years of stability at the 3,100 full-time permanent staff member level, NBS has been reduced to about 2,700 full-time permanent staff positions in 1983.

Such a large reduction in force in so short a time has devastating effects on any the scientific organization. For many of the metrology programs, it takes years of experience to develop a staff member to the level of expertise necessary to be an effective contributor. Metrology research requires greater stability in personnel than many other scientific and technological enterprises.

The major budget cuts in the proposed 1984 budget have further serious implications on staffing. If the proposed budget were to be implemented, it would lead to a direct reduction of about 180 staff members; an additional 300 positions would also be seriously threatened. Such drastic reductions would have a most unfortunate effect on the ability of the National Bureau of Standards to carry out its mission.

Let me now discuss the budget cuts themselves. In the case of the three centers—namely the Center for Fire Research, the Center for Building Technology, and the Institute for Computer Science and Technology—an investment in research today would result in savings to the Federal Government and to the Nation

many times over in the future. In my written testimony I give detailed examples in support of this statement.

Let me say a few words about the Center for Fire Research. I make a strong plea here for the full restoration of funding to the Center for Fire Research. This program was cut by $5.866 million in the proposed 1984 budget. Work at the Bureau in this field is highly sophisticated, basic research and is greatly respected by the research community outside. The research programs at NBS are unique. This work could not be done in the private sector in any way.

This sector is fragmented and lacks the necessary expertise to carry out the kind of program that is done at the Bureau. Fire research is of great societal benefit. It results in great savings of life and property. Such simple devices as fire alarms and sprinkler systems, if they work properly—and that is, of course, guaranteed by programs like those at the Bureau—such devices can result in enormous savings in life and property.

Fire research provides high leverage. Establishing standards is important in reducing costs to achieve adequate levels of safety. Investment in fire research can be repaid many times over in savings in construction and, ultimately, in savings to the consumer.

Let me make a few remarks on the Center for Building Technology. The cut of $3.174 million and elimination of the Center for Building Technology would be a tragic loss to the Nation. The research program in building technology is unique and is the only major program of its kind in the United States. It is vital to the consumer and to the general public.

Basic research in building technology cannot and will not be done by industry. This industry is highly fragmented. The expertise is lacking. The neutral position of the Bureau of Standards is vital for many of the research programs, such as, for example, the investigation of structural failures—and I give a number of examples of this in my written testimony.

A nonproprietary posture is important for influencing standards and building codes. It is only the Bureau that has this nonproprietary position. The leverage of basic research in building technology is high. The setting of building standards and the establishment of test procedures can greatly reduce costs in achieving conservative margins for safety. Many examples can be given to show that savings far exceed the research investments.

I would like next to comment about the Institute of Computer Science and Technology. Senator Lautenberg made some very important comments that resonate strongly with my written testimony. The proposed budget cut from $10 million to $3 million is particularly devastating and imprudent. Of all programs at NBS, that of the ICST is perhaps the most cost effective.

For every dollar invested in ICST, a much larger savings is applied elsewhere in Government, through implementation of Federal information processing standards, known commonly as FIPS. To perform its Brooks Act-mandated functions—standards program development and management, assistance to other Government agencies, research and development in computer sciences and technology—ICST should have the resources and budget needed for a balanced program.

The evaluation panels have suggested that such a balanced program would require from between $15 million and $20 million in the 1984 budget. And the ICST, as well, desperately needs an increase in several slots.

In this context, the cut from $10 million to $3 million is particularly devastating. Such a drastic reduction would eliminate the ADP standards program, which is enthusiastically supported by the evaluations panel and is mandated, in fact, by the Brooks Act.

A significant component of the ICST mandate is to assist other agencies of government in shopping around for the best computer bargain available, through effective specification and procurement practices.

Because of the billions of dollars involved, the savings to the Federal Government by this one single function could save many millions of dollars, far more than the most extravagant budget imaginable for ICST. In my written testimony I give several other examples how a small investment in ICST could result in much larger savings to the Federal Government.

I would like to make some comments also about the standard reference materials and a measurement assurance programs. The proposed 1984 budget calls for a reduction of $438,000 in the budget for standard reference materials and $1.933 million reduction for the measurement assurance program, effectively wiping out that program.

I make a plea for the restoration of these funds. These programs are very important to industry and to the general public. In some cases, increased recovery of funds from the users may indeed be possible. However, in many cases, and, in fact, most cases, it is just simply not possible to recovery fully the cost of the research investment that is involved in generating the standard reference materials or the measurement assurance programs.

These are unique services that cannot be done elsewhere. In many cases, the most important consideration of the standard reference materials or the measurement assurance programs is that they be used. This is, in fact, much more important than their actual cost. Now in my written testimony I give a number of examples supporting this.

For example, clinical standard reference materials, which are used in hospitals. It is essential that we do not price these services out of the range of the user community. A case-by-case examination of the pricing of standard reference materials and measurement assurance programs is recommended to provide a greater recovery of cost for the future, where possible. But for the present I strongly recommend restoration of funding for the standard reference material and measurement assurance programs until an orderly process is established for increased recovery of funds.

Finally, I would like to make some comments about increased funding in basic research. The 1984 Federal budget in general calls for significantly increased funding in basic research. The increase of 18 percent in the National Science Foundation budget is typical of such increases, and other numbers were given before by the Senator.

In this context, let me emphasize that the National Bureau of Standards is the Federal laboratory with the greatest long term

dedication to basic research at the cutting edge. I therefore urge modest increases in basic research at the Bureau in the following areas: highly selected areas of excellence at NBS, areas of great research opportunity, and areas of great importance to the mission of the Bureau of Standards as defined in the Organic Act.

Mr. Chairman, let me conclude my oral remarks by thanking you for this opportunity to speak on these very important matters. I would be happy to answer any questions that you might have.

Senator GORTON. With respect to overall innovation and productivity in the Nation, do you think there will be a relationship between those two factors in the Nation and these budget cuts? How does NBS contribute to innovation and productivity?

Dr. DRESSELHAUS. NBS contributes in a significant and important way to commerce and industrial developments. Serious cuts in the NBS budget in general would be detrimental to the economy and trade. There is no question about this. I think we can document this over many years.

The particular areas of the budget cuts do indeed affect the Nation. For example, fire research is a national issue. The SRM's are also a national issue. The issue of computer science has very grave national implications, governmental implications and also international implications. Of all the different cuts that we are discussing, that is the one with the greatest impact on the economy.

Senator GORTON. Thank you.

Both in your written and oral testimony you have suggested certain targeted high-priority areas that should receive research budget increases. Can you be more specific as to the areas to which you would direct those increases?

Dr. DRESSELHAUS. I targeted some general areas, for example, as areas where the NBS has an international reputation of excellence. This initiative is very important as a chance to maintain a desirable level of competence, and for the Bureau, to attract skillful people. A place is only as good as its people, and it is essential for the Bureau to be preeminent in a number of fields.

Some of the specific fields where the Bureau is superb, would include the surface science and material areas, areas of metals processing, phase diagrams. In those areas the Bureau is certainly preeminent. JILA is an example of a University/Bureau of Standards collaborative venture that is superb.

The post-doc program is an area which cuts across the Bureau in various horizontal and vertical dimensions and represents an excellent target of opportunity. The post-doc program is an extremely important program. I think the number of Fellows they now have is on the order of 30 per year. Increasing that by, say, 10 Fellows would have a tremendous impact on the program at the Bureau and also in the Nation, particularly in educational activities and technology transfer. So that would be one place where increased investment makes sense.

The second category corresponds to a great research opportunity, and some areas like this would be microelectronics, for example, where the Bureau is establishing a foothold that has an important bearing on national industry.

The semiconductor electronics industry is a rapidly growing industry in this country, and if the Bureau is going to have any input

in this industry, it must come into this field more strongly right now, then and there. The program at the Bureau is an excellent program, but it needs latitude for growth. Some small amount of dollars spent there right now would have a profound influence. So this would be one area where increased funding would be useful.

The area of metals processing is another area where increased funding would provide leverage. Metals processing is vital to the metals industry, and the aircraft industry. Several areas of metals processing, such as the type of rapid solidification technology which is very well done at the Bureau could be enhanced.

Senator GORTON. How many of these areas that you have discussed would be carried on as well and as promptly in the private sector?

Dr. DRESSELHAUS. The private sector works in some of these areas but in a different way. The standards part of these programs is largely done only at the Bureau and can be done only at the Bureau. For example, the phase-diagram work and work that has to do with validating data that is used throughout the industry; these are examples of work primarily done at the Bureau. Thus a fraction of the present program could be done by industry, or by the university sector for that matter. But there is another very important part or component that will only be done at the Bureau; and cutting programs of this type has a devastating influence on the overall program.

I would say that in the microelectronics program there is a need for expansion in the standards area, and that fits very nicely into all three categories which I mentioned above.

Senator GORTON. Doctor, if the Center for Building Technology were terminated, what would you predict the consequences to be, first, for the building community and, second, for the general public?

Dr. DRESSELHAUS. I am glad you asked that question because the Center for Building Technology, as I indicated, is the only program of its kind in the Nation. The extent of funding, perhaps $22 million, is a very, very small figure for an industry involving billions of dollars of business. I think that the construction industry is 8 percent of the GNP, or something like that, and $22 million for the largest research program in the country is really a small number compared to the total program. This is an area where a small investment has an extremely high leverage.

This program could not be taken over by the public sector because most of the construction industry is very highly fragmented, consisting of many small companies and entrepreneurs with two, three, or four people per company; there is no way that these organizations can do any significant research.

There is also the standards question. When you are involved in a large building project that costs several million dollars, maybe even up to $100 million, there are savings that can be realized by applications of standards to such issues as the thicknesses of walls, or the amount of steel required in a support link, et cetera. With standards one can calculate the materials requirements so that proper margins of safety can be used.

Such calculations can be made. Research in support of this approach is the sort of thing that the Bureau of Standards is so good

at. This can save the industry great amounts of money, and also the Government in the construction of Government buildings. So a small investment, and we are talking about a small investment, can have a profound influence. There is no other place in Government or in the private sector where this research would or could be done.

Senator GORTON. Thank you very much.

Senator Lautenberg.

Senator LAUTENBERG. Very briefly, Mr. Chairman.

Dr. Dresselhaus, you and I are singing the same tune here. I think obviously that your concerns are those that ought to be prominently heard.

There are cuts in the budget here supported by the Director of the Bureau and that concerns me, because I think it challenges what the definition of the responsibility of that Bureau ought to be. I am pleased to see that the group that you represent, all of them professionals, scientists, feel that more work has to be done.

I obviously agree totally with the emphasis in the area of computer technology. Regarding the other two sections, fire and building technology, those cuts are painful because they may impede the adoption of safety measures that in many cases can be lifesaving. When we talk about ICST, the cuts could almost be mortal for certain segments of industry.

We know that in Japan there is a concerted effort in the large scale systems area that has us very much already, if not running second best, trying to stay abreast, and that is not so good when so much of our economic and social development, which is not being discussed here, is dependent upon the continued development of our technology.

We look at what used to be called the wired nation, now the communicator nation, where terminals will be coming to many households for the passing of information, maybe even for teaching the handicapped, those who are distant from the schools. This must be part of the continued opportunity for our citizens.

I think that it is pitiful to think of a $3 million budget for this agency—not to dominate, and not to manage—but to at least help provide some coordination among some of the disparate elements that are manufacturers and designers of equipment. I think coordination will not come if left solely to the private sector.

I am a strong advocate of government noninterference when a governmental role is not necessary, but I do believe that Government has to set standards in something developing as rapidly as we see in technology in the computer field. There is an argument proposed that says that if we have standardization in the computer industry that that might actually impede innovation by casting in concrete current processes and discouraging the implementation of new ones. Does that sound like it makes sense to you?

Dr. DRESSELHAUS. Of course, you know the computer business better than I do, but I live very close to Route 128, and if you live close to there——

Senator LAUTENBERG. You can say an ADP Office, if you would like to.

Dr. DRESSELHAUS. Not only ADP, but you have quite a few competitors out there.

Senator LAUTENBERG. I want to talk about them.

Dr. DRESSELHAUS. One thing that we know about the computer business is that our graduates, age 22, go out to places like Route 128 and they form small companies with bright new ideas. Many of them are extremely successful and they bring glory and lots of dollars to themselves, but they also bring great progress to the computer industry.

However, when one person's widget doesn't fit with another person's widget, it is the consumer that has to face a big problem at the interface. It is at this point where the Bureau of Standards can be very helpful.

The concepts, of course, are going to be created by the young people as they come in with their new ideas. There is no way that we are going to turn that off. That is the big thing that we have up on the Japanese. It is these young people with all their ideas that is our strength. And we want to keep these young people coming.

Senator LAUTENBERG. Absolutely, and that is why we want to invest more in our educational system to continue the incentive for basic research, because that ultimately produces the entrepreneurs, the imaginative business leadership that you are talking about. This is an industry where there is opportunity for individuals, for companies, for young people just getting started, witness Apple, but there are many other successes not quite as prominent.

Again, as I said before, sometimes you buy a piece of equipment, a CPU, and you want to add peripheral gear to it, incompatibility is a very serious cost. It is a totally negative process, when we could do things more efficiently and efficiency is only going to come from one place in my view, and that is to have a standard set by which the industry must live.

Are you aware of the effort that is being put forth by the foreign governments in the standard setting process, France, Japan, and so forth?

Dr. DRESSELHAUS. Yes. They have larger programs in this area than we do at the moment. We are doing pretty well in the computer business right now, but to stay up there we have got to muster all of our resources including ICST. I think that support of ICST is going to be very important in keeping ahead in the international arena.

Senator LAUTENBERG. Do you think that it is possible for us to lose some of that edge that we have had?

Dr. DRESSELHAUS. This is one good way to lose the edge. I think a cut in the ICST budget to $3 million is one good way to sell out to our foreign competitors.

Senator LAUTENBERG. It is a pitifully small budget even at $10 million.

Dr. DRESSELHAUS. The recommendation that we have made in the evaluation panels is the full restoration of the $10 million budget plus some other agency funding, so that we can work with the other agencies to reduce their expenditures and improve their efficiency in the use of computers. Most of the other agencies don't have the expertise to know what computers to buy or how to handle the interfacing, and related problems. ICST has that expertise, and also the charter and mandate to be helpful.

Senator LAUTENBERG. I couldn't agree more. Mr. Chairman, I don't think there is any point in going on.

Thank you very much, Dr. Dresselhaus.

[The statement follows:]

STATEMENT OF DR. MILDRED S. DRESSELHAUS, CHAIRMAN, EVALUATION PANELS, NATIONAL BUREAU OF STANDARDS

INTRODUCTION

I am honored by the invitation to appear before this Senate Subcommittee on Science, Technology, and Space to discuss my views on the technical activities of the National Bureau of Standards (NBS). I speak in my capacity as Chairman of the Evaluation Panels for the National Bureau of Standards. My most recent testimony before this Subcommittee was on March 17, 1982. I am pleased to have this opportunity to update my earlier remarks. I speak here both as an academic research scientist and as a representative of about 180 members of the various Evaluation Panels. Let me provide you with some background on the Evaluation Panels.

Since 1959, the National Bureau of Standards has invited the National Academy of Sciences to provide an annual, external evaluation of the technical functions and operations of NBS. Panel members are selected by the National Research Council, the operating arm of the Academy, from leaders in a wide range of science and engineering fields. The Panel members are broadly representative of industry, government, and academia. The term of a Panel member is usually 3 years and never more than 6 years. Panel members are reimbursed for travel expenses, but they receive no honoraria. Nevertheless, we have no trouble in persuading people of high caliber to serve on the Panels. This attests to the great importance that panelists place on the programs and services of NBS. Over the years, more than 1,000 technical experts have served on the Evaluation Panels. Each year the Panels address a number of general questions for each Center and Office as well as special initiatives defined by the Steering Committee of the Evaluation Panels.

Among the general questions addressed by the Panels are the following:

1. Do research plans and programs address critical technical issues within the scope of the mission of NBS and its Centers?
2. Is the planning adequate for reaching near-term and long-term objectives for the technical programs of the Centers?
3. Is the research work appropriate and effective in reaching the objectives of the programs?
4. Is the research work of high quality and at the state of the art?
5. Are the technical approaches and methodologies appropriate?
6. Are the staff skills and expertise adequate for the conduct of the work?
7. Are the available facilities and equipment adequate for the conduct of the work?
8. Is the dissemination of technical results to the scientific community, industry, and the general public satisfactory?

Special initiatives that have been addressed include the Scientific Computing Needs of NBS (Fiscal Year 1980); General-Purpose Equipment Needs of NBS (Fiscal Year 1981); Competence Building Programs, the Effect of Personnel Cuts on the Technical Programs, and NBS Programs that Impact National Productivity (Fiscal Year 1982); and Effectiveness of Communication and User Charges (Fiscal Year 1983).

Guidance and general oversight to the Panels are provided by a six-member Steering Committee, which I chair. The Steering Committee determines general guidelines for the Panel reviews and identifies special issues or initiatives for each year. The Steering Committee also reviews the written reports of all Panels before they are submitted to the National Research Council for final approval and publication. There are 3 general Panels for the major operating units of NBS and currently 15 Subpanels for specific program areas.

The Panel for the National Measurement Laboratory has Subpanels for Nondestructive Evaluation, Standard Reference Data, Absolute Physical Quantities, Laboratory Astrophysics, Radiation Research, Chemical Physics, Analytical Chemistry, and Materials Science.

The Panel for the National Engineering Laboratory has subpanels for Applied Mathematics, Scientific Computing, Electronics and Electrical Engineering, Manufacturing Engineering, Building Technology, Fire Research, and Chemical Engineering.

The Panel for the Institute for Computer Sciences and Technology has only seven members and no formal Subpanels.

As the research and metrology program at the Bureau has decreased in level of effort, the number of Evaluation Panels has also decreased. For example, during 1981–1928, the Panels for Environmental Measurements and Consumer Product Technology were discontinued because of corresponding cuts in NBS program funds. During 1982–1983, the Panels for Recycled Materials and Measurement Serivces were also discontinued.

The written reports of the Panels are delivered to the Director of NBS and to other organizations that have requested them, such as the Department of Commerce, the Office of Management and Budget, the General Accounting Office, the Congressional Research Service, and the staff of your Committee.

ISSUES OF CONCERN TO THE EVALUATION PANELS

In my letter of December 9 to the staff of your committee, I identified some issues of concern to the Evaluation Panels. Additional concerns were identified during the meeting with the NBS Visiting Committee on February 2, 1983. In my testimony today I would like to focus on several issues of particular concern.

1. Drastic program cuts in proposed 1984 budget

Of greatest concern to us are the drastic program cuts in the proposed 1984 Budget, especially the elimination of funding for the Center for Fire Research and the Center for Building Technology; the large cut in funding for the Institute for Computer Sciences and Technology from $10 million to $3 million; and the major cuts in the Standard Reference Materials Program and the Measurement Assurance Programs. My grave concern about each of these program cuts is expressed in more detail below.

2. Staff reductions

Staffing reductions during 1979–1982 have seriously reduced the effectiveness of NBS programs, severely restricted the ability of NBS to move into important new areas, and contributed to a serious morale problem. After years of stability at about 3,100 full-time permanent (FTP) staff members, NBS has been reduced to about 2,700 FTP's in fiscal year 1983. Such a large reduction in force in so short a time has devastating effects on a scientific organization. For many of the metrology programs, it takes years of experience to develop a staff member to the level of expertise necessary to be an effective contributor to a metrology research program. Metrology research requires greater stability in personnel than do many other scientific and technological enterprises. Rapid personnel turnover is devastating to the performance of metrology research groups.

The major budget cuts in the proposed 1984 Budget have further serious implications on staffing for 1984. If the Budget were to be implemented, it would lead to a direct reduction of about 180 staff members; and an additional 300 positions, currently supported on overhead and other-agency funds, would be seriously threatened. Such drastic personnel reductions have a most unfortunate effect on the ability of NBS to carry out its mission. Such cuts would have a serious effect on morale, causing key people to leave or seek early retirement. When large personnel cuts occur, it is the young people who are most adversely affected. These young people are vital to the future of the NBS program, bringing to the Bureau new ideas, new techniques, and youthful enthusiasm.

We view the personnel cuts implied by the proposed 1984 Budget with grave concern and recommend in the strongest possible terms that no further reductions in staff occur in 1984. We further recommend that more resident predoctoral and postdoctoral fellowships be encouraged. We also recommend an expansion of the Industrial Research Associates Program.

3. Rigid constraints on research program

Because of the tight budgetary situation and the great reduction in staff positions since 1979, NBS has had little flexibility to go into promising new areas of precision measurement. For example: (1) structure and electronic properties of clusters and similar microensembles; (2) time-resolved thermodynamic and electrical measurements; (3) reference data for biophysical and biochemical applications; and (4) calibration of automated test equipment and of complex semiconductor devices.

With the present Administration's emphasis on basic research and the fostering of high-technology industry, it would appear that increased funding should be provided to the high-priority, high-technology metrology programs at NBS. Metrology is the basic mission of the National Bureau of Standards, and NBS provides interna-

tional leadership in this area. Because of the great dependence of industry and commerce on metrology, adequate resources must be found to maintain the Bureau's vitality in this field.

In recognition of the importance of particular high-priority areas Congress may decide to impose floors on certain specified programs. Such restrictions, while helpful in safeguarding the high-priority programs, can be counterproductive if funding of the programs is not provided concurrently. For example, if the proposed 1984 Budget is not restored to the 1983 level, I would urge that no constraints in the form of floors be imposed. In times of severe budgetary constraints, the management of NBS needs to maintain a significant degree of flexibility.

4. Policy guidance

The Administration has instructed NBS to withdraw from some applied programs. For example, automation has been under particular scrutiny by the Administration for several years. Congress, on the other hand, has been encouraging NBS to increase its effort in areas such as automation. Resolution of these conflicting policy signals is a high-priority issue for NBS. The NBS Evaluation Panels have been extremely pleased with the achievements of the automation program and have enthusiastically recommended that it be strengthened. Such a program is essential for the United States to maintain leadership in worldwide manufacturing.

The proposed 1984 Budget totally eliminates funding for the Centers for Building Technology and Fire Research and severely reduces funding for the Institute for Computer Sciences and Technology. In my testimony today, I focus on the importance of these programs to the nation and make a strong plea for the restoration of their funding.

Let me be very clear about the point I am making. The Administration has selected certain programs for drastic cuts. These programs have been under steady attack for several years. On the other hand, Congress has given high priority to some of these same programs. Because of the nature of metrology research, it is necessary to have a measure of stability in the funding of these programs. Conflicting policy signals from the Administration and Congress often give rise to rapid fluctuations in funding that are counterproductive. The Evaluation Panels make a strong plea that there be a resolution to these conflicting policy signals.

5. Asymmetry of basic research funding in the proposed 1984 budget

It is difficult to understand the devastating budget cuts in basic research of the NBS funding for 1984 in view of the general policy of the 1984 Federal budget, which shows a large increase of 18 percent in basic research across the various agencies. For example, the National Science Foundation 1984 budget is increased by 18 percent.

To my knowledge the National Bureau of Standards is the only prestigious Federal laboratory in basic research that has not only received no increases in funding but rather has received severe budget cuts. The National Bureau of Standards has a worldwide reputation of excellence in many areas of basic research and is a unique international resource in the area of metrology and standards. In keeping with the Administration's strong support of basic research at the cutting edge, I recommend that budget increases be made in certain targeted high-priority areas, in areas of excellence, and in areas where there are unique opportunities for breakthroughs.

CONCERNS ABOUT PROGRAM CUTS IN PROPOSED 1984 BUDGET

1. Center for fire research

The $5.886 million reduction in funding for the Center for Fire Research is an especially devastating blow to a center of excellence at NBS and to a center carrying out a unique service to the public sector. Prior to fiscal year 1983, the Center for Fire Research received a large part of its funding as a direct pass through from the Federal Emergency Management Agency (FEMA). Beginning in fiscal year 1983, it was decided to include these funds directly in the NBS budget. In fact, an additional $850,000 was added during the Congressional Authorization hearings last year, to reach to total of $5.886 million that the Administration now proposes to eliminate.

The program of the Center for Fire Research is highly appropriate to the mission of NBS and is at the cutting edge of the field. I cite below the work of Professor Emmons to establish the fact that fundamental research in combustion and fire has high stature in the basic research community. Professor Howard W. Emmons of Harvard University served for several years as Chairman of the Evaluation Panel for the Center for Fire Research and more recently as Chairman of the Evaluation Panel for the National Engineering Laboratory. To underscore the basic research aspects of research on combustion and fire, I mention here the work of Professor

Emmons, who was the 1982 recipient of the highly coveted American Physical Society Prize on Fluid Dynamics for his contributions to the fluid mechanics of combustion and fire. It is from Prof. Emmons, and other eminent Panel members, that I have obtained the information for my remarks.

The Evaluation Panels emphasize in the strongest possible terms the importance of restoring these funds to the operation of the Center for Fire Research. This Center provides great benefit to the general public.

The NBS effort in fire research is a broadly based program involving many basic and sophisticated scientific issues. It is the only technical program aimed at reducing the incidence of fires in residences (homes, hotels, and care facilities) and at reducing the loss of lives and severity of injuries. Fires account for the annual loss of 8,000 lives, the infliction of 200,000 injuries, and $20 billion in direct and indirect property costs. Of the various types of fires, residential fires account for 77 percent of deaths, 68 percent of injuries, and 46 percent of property losses. In terms of fatalities, injuries, loss of property, and economic losses, the cost of fire is higher in the United States (both per capita and in dollars) than in any other industrialized country in the world, with the exception of Canada, where it is about the same. During the 36 years since 1946, more people have died or been injured in fires in the United States than were killed or injured in bombing raids in Europe during World War II. Fire losses thus represent serious losses of life and property and are a national problem.

As mentioned above, the NBS program is the only one aimed at reducing human property losses due to residential fires. There is little incentive for the private sector to address the problem of residential fires effectively for the following reasons. The fire insurance underwriters set premiums on an actuarial basis. Their profits do not depend on reducing losses of life or property. Fire departments concern themselves directly with fire fighting and are in no position to mount a scientific research program to reduce losses due to fires. When viewed as an industry, fire fighters are highly fragmented and lack the resources and expertise to mount a scientific research program to address the relevant issues.

Some significant work in fire research is indeed carried out in the private sector. This work is, however, narrowly focused. Research on the technology and development of fire alarms, smoke detectors, and other warning devices takes place in the private sector. Product certification is handled by the Underwriters Laboratories, but the performance requirements and test methods have been developed at NBS. The Factory Mutual Research Corporation is engaged in research on fire protection of industrial buildings, but these fire-protection systems are not suitable for residences. The Center for Fire Research has the only program designed to carry out generic research in the broad area of fire.

The center for Fire Research has consistently produced excellent contributions to the field of fire-safety research. It has been recognized as the world leader in its field. Many important accomplishments have been made. Research on the characterization and movement of smoke has been carried out in order to develop more sensitive and reliable techniques for detecting fires and to provide guidance for the location of fire detectors. Recent decreases in the U.S. fire fatality rate probably reflect the increased use of these detector systems. Another program is aimed at developing procedures for screening materials on the basis of the toxicity of their combustion products. Another project has identified the cigarette ignition of mattresses and upholstered furniture as the single largest cause of fatalities in fires. The Center for Fire Research recently developed test methods for determining the resistance of furnishings to ignition by cigarettes. Such test measurements, procedures, and standards can result in major societal benefits such as reducing losses and saving lives. In another program, methods for determining the egress time for a burning room were developed. The Center for Fire Research is well known for its computer models supported by laboratory research on the ignition and propagation of smoldering combustion and the effect of fire retardants on these processes. The excellent performance of the Center in fire research has been largely due to the excellence and dedication of the technical staff.

As mentioned above, the Center for Fire Research has been a leader in this field. Recently, major investments in research facilities have been made by many other countries including Japan, the United Kingdom, Canada, France, Germany, and Russia. While fire research facilities at NBS are reasonably adequate for many projects, NBS has been using other facilities in Japan, France, and Canada to perform studies that it cannot carry out at its own site. Resources are needed to modernize the Bureau's fire research facilities.

For the many arguments given above, the Center for Fire Research is highly cost-effective for the national economy. A small investment in fire research today may

result in major savings in the prevention of future loss of life and property. The Evaluation Panels urge in the strongest terms that funding be restored to the Center for Fire Research. In addition, we urge that attention be given to updating the fire testing facilities so that more efficent use can be made of the present staff. The contribution of the Center in the field of fire science is an essential part of our international leadership in science and engineering.

2. Center for building technology

The $3.174 million cut in funding for the Center for Building Technology represents a tragic loss to the nation. On behalf of the Evaluation Panels, I make a strong case here for the restoration of this funding. There are several reasons why the research program at NBS is unique, is vital to consumers and the general public, but cannot and will not be done by industry.

Construction is one of the largest industries in this nation and has certain special characteristics. In 1981 the construction industry accounted for $234 billion or 8 percent of the gross national product. It is a highly fragmented industry with 4.3 million workers in 1.2 million firms, 60 percent of which are one-person firms. For this reason, the industry would have great difficulty in mounting a significant research program. The Center for Building Technology is ideally equipped to do research on construction standards, building codes, and causes for structural failures.

The National Bureau of Standards is the only comprehensive, nonproprietary laboratory dedicated to meeting the measurement requirements of the entire industry. The Bureau has programs in structural engineering, building materials, and building equipment. The nonproprietary position of the Bureau is essential for the important role played in providing data and test procedures used to establish standards for the building industry. There is no other laboratory that can supply such a broad range of information on a nonproprietary, neutral basis.

The neutral position of the Bureau is essential for executing many of the major contributions of the Center for Building Technology, as for example the identification of structural failures. Some examples of structural failures that were investigated by the Center for Building Technology in recent years include the collapse of the hotel walkway in Kansas City (which killed 114 people in 1981), the failure of the overpass in East Chicago (which killed 13 workers in 1982), and the collapse of the cooling tower at Willow Island (which killed 51 workers in 1978). The NBS investigation teams have established a widely respected impartial position in such highly sensitive investigations.

The Evaluation Panel for the Center for Building Technology has for a number of years stressed the importance of the core research program, although other-agency support has consistently been high (about 68 percent). The core support is essential to maintain the broad base of competence needed to keep abreast of the field. Other-agency programs are valuable in keeping the staff closely in touch with real-world problems, but other-agency programs tend to emphasize short-term benefits consistent with the missions of these agencies. Thus, the core program and the other-agency programs are both essential and mutually complimentary.

Let me now provide insight into some of the recent technical accomplishments of the Center for Building Technology and indicate why this work is important. I have already referred to the technical investigations of the causes of three recent, well-known structural failures. The Center has carried out research on occupancy, wind, and earthquake loads; on the prediction of structural resistance; and on structural reliability. The results of this research have been incorporated into the 1982 the American National Standards Institute (ANSI) standard entitled "Minimum Design Loads for Buildings and Other Structures."

The Center has been actively providing technical support to the private sector "Building Seismic Safety Council" in the formulation of nationally applicable, comprehensive seismic design provisions suitable for use in voluntary standards and building codes.

Such metrological techniques and standrds are vital for efficient and safe operation in the construction industry. There is much evidence to confirm my claim that the Center for Building Technology plays a unique role in support of this fragmented industry. My remarks are based on information from our Panel for Building Technology, which has had distinguished members from universities and many elements of the construction industry.

3. Institute for Computer Sciences and Technology

The proposed 1984 budget cut for the Institute for Computer Sciences and Technology (ICST) from $10 million to $3 million is particularly devastating and imprudent. A reduction in general Federal spending is a high priority for this Administration and indeed for the nation. In this context let me point out that the program of

ICST is such that one dollar spent well and wisely in research offers cost-saving returns of many dollars and on continuing basis. In considering the question of funding ICST, one should not only consider how much it costs but also how much money is saved elsewhere in government through the implementation of Federal Information Processing Standards.

To perform its Brooks Act mandated functions of (1) standards program development and management, (2) assistance to other government agencies, and (3) research and development in computer science and technology, ICST should have the resources and budget needed for a balanced program. The Evaluation Panels have suggested that such a balanced program would require between $15 million and $20 million in the 1984 budget as well as an increase of several slots. In this context, the cut from $10 million to $3 million is devastating. Such a drastic reduction would eliminate the ADP standards program, which is enthusiastically supported by the Evaluation Panel for the Institute for Computer Sciences and Technology and is, in fact, mandated by the Brooks Act.

The unique benefits of the ICST functions stem directly from the pervasive inability of government and society as a whole to function today without the use of computers. Computers affect, directly or indirectly, aspects of every function of our world today. Although their cost-effectiveness have made them indispensable, many inefficiencies in their use have crept in. It is this combination of indispensability and inefficiencies, all at the same time, that leads to the guaranteed high payoff from efforts to provide guidelines and (where possible) standards for the better use of computers. That is precisely the mandate and function of ICST. There is no other government agency that duplicates or overlaps the sweeping charter of ICST. Every government agency and much of the private sector stands to benefit directly from enabling ICST to fulfill its charter.

Although less than 30 years old, the computer hardware, software, and systems business is a big industry—so big that even though the U.S. Government is by far the largest single customer of that industry worldwide, nonetheless it still accounts for only about 7 percent of the total U.S. market. If government use is so small, how can a government ICST program be expected to be effective? Why should not the government forget the ICST program and merely shop for the best bargains in the computer marketplace? A significant component of the ICST mandate is indeed to assist the other agencies of government in doing precisely such shopping through effective specification and procurement practices. This is one of the most visible areas where ICST results can help save millions of dollars more than the most extravagent ICST budget imaginable, because of the billions of dollars involved. But that is only a fraction of the total story.

It is through leverage that the 7 percent government share can significantly affect the other 93 percent share of the computer industry market. Technical improvements never come free. It is fair to say that the customer-oriented Guidlines and Recommended Policies are today more numerous and more important than actual standards in the ICST product output. These Guidelines and Policies require some technology and product-offering adjustments to be made by the suppliers, and these changes cost money. Most of these improvement costs are spread by the industry vendors over the full 100 percent customer base, resulting in low individual costs. By being the largest single customer, the government's 7 percent involvement is highly leveraged indeed.

The ICST role and function, by the nature of the complex computer industry, is much a service-to-the-citizen function. The same benefits that accure to the government's 7 percent involvement also apply to the private sector's 93 percent. In absolute numbers, the people and funds, and even the specific Guideline and Standards output products of ICST, may be small, but their beneficial effects are large.

In order to tap the 93 percent leverage potential, it is essential that ICST participate actively and directly in industry efforts to achieve standardization and compatibility of system and component interfaces. Only by ensuring acquiescence from the much larger private sector can the government-based needs benefit from the economies of scale. In the United States the standards activity, including participation by ICST and other government agencies, is entirely voluntary. ICST participates in this activity through organizations such as the American National Standards Institute and various business and professional organizations. These organizatons, in turn, interact with The International Organization for Standardization (ISO). ICST also serves as the major technical contributor to ISO, thereby assuring furtherance of U.S. interests in the international marketplace.

Over the years, ICST has played a highly effective role in the national and worldwide standards activity. Standardization activity is always competitive and is often coercive. Business implications give large companies extra weight, pro or con. ICST

participation is needed not only to have government concerns properly weighed but also to help represent the weaker elements of the public sector. The fact that Federal Information Processing Standards (FIPS) can be required in government procurements is frequently an important factor in these private-sector deliberations. The FIPs program is the major focus of ICST. Although the adoption and enforcement of FIPS is not an ICST function, FIPS are issued, maintained, and interpreted by ICST. Thus, ICST is important and is one of the most influential contributors to the standardization process. Again, the leverage comes from the delivery of results that are acceptable from a technical and business point of view, so that competition is focused on improvement of delivered results, and economies of scale are allowed to operate in a more orderly marketplace. Success yields significant monetary and performance benefits to the government and private sector alike.

ICST plays a central role in the complex international process of establishing standards for the several levels of network protocols. The importance of this task and the unique contribution of ICST is clearly recognized by the Department of Defense and most computer vendors. Excellent contributions have also recently been made in the areas of software engineering and network modeling and design.

A strong competence program is needed to attract, maintain, and vitalize competent technical staff. This is especially true for ICST, because much of the detailed work of standards preparation and evaluation is, by its nature, focused on mature subjects relative to current fields of interest. But to perform well, those who do the standards work must be involved in the most current research. ICST research and development should support the basic standardization and metrology program and cover subject areas that are unique, useful, and not duplicated elsewhere. Valuable contributions have been made recently by three ICST competence efforts on local area network messages and control, abstract data models, and intermediate program representation.

The need for progressive, governmental coordination of software and hardware developments was the motivation for the Brooks Act, and it was reaffirmed in the Paperwork Reduction Act. Now most computer vendors see this need as well and turn to ICST for leadership. Important work is being done on network interfaces and protocol standards to make it possible to interconnect computers, peripherals, office systems, and networks. The generation of standards in these fields cannot be done by physical experiments in an isolated laboratory; it requires the exploration of complex tradeoffs and the generation of a consensus. The network protocol activity is a paradigm for this process.

It is regrettable that a shortage of people prevents ICST from performing much-needed other-agency work, even though it would be done on a reimbursable basis. The need for ICST expertise by other agencies continues to grow explosively. Significant additional ICST slots are needed to provide this service to other agencies. When other-agency requests to ICST must be turned down for lack of personnel, the requesting agency must look elsewhere to second-choice, probably less able and more expensive, sources to fulfill their needs (or else have those needs go unsatisfied). If other-agency work is turned down, ICST loses a source of funds that would be well earned for the goods and services delivered, allowing it to fulfill its overall Brooks Act mandate more fully. ICST management and staff need other-agency involvement to provide a valuable source of hands-on, real-world, ongoing experience that is invaluable to the effectiveness of the total ICST program. It is essential to preserve the momentum that ICST has gained in recent years. Given the rapidly changing computer and communication technology, a lack of coordination now could introduce a level of chaos (and cost) that could negate the anticipated productivity improvements. The recent efforts of ICST can be shown to be cost-effective. The reduction in duplicated effort and incompatible systems at other Federal sites amply justify the continued support and even expansion of the ICST function.

Any budget under $10 million would jeopardize the ability of ICST to work with international voluntary standards development groups, computer manufacturers, and industry ADP users, and it would also jeopardize ICST efforts to carry out needed research in support of standards. A modest increase in funding beyond the $10 million level would be an excellent investment.

4. Standard reference materials and measurement assurance programs

The proposed 1984 Budget under discussion calls for a reduction of $438,000 in the Standard Reference Materials (SRM) program and an elimination of the total $1.933 million in the Measurement Assurance Program (MAP). The argument given for these reductions is that the SRM and MAP programs provide an important service to industry, the government, and the private sector, and it is appropriate for the beneficiary of the service to reimburse NBS fully for the cost of the service. At pres-

ent, the beneficiaries of the services pay for the incremental cost of the service itself but not for the research necessary to generate the SRM or MAP. According to the new policy, the beneficiaries would also pay fully for the research and development costs.

These policy issues have been discussed by the Evaluation Panels for some years and are in fact one central focus for the 1983 Evaluation Panels. It has been the consensus of the Evaluation Panels over the years that the beneficiaries be asked to contribute to some, out not all, of the research costs of SRMs and MAPs and that the change in policy be implemented gradually over a period of years. It has been further suggested that the price increases should be applied on a case-by-case basis to each SRM and MAP because of the wide variation in the cost of the research and development programs and the wide variation in the ability of the beneficiary to pay for the services. It is in the best interest of all concerned that the prices be set low enough so that the groups in real need of SRMs and MAPs are able to afford to use them. We must at all times remember that the use of these standards is in the public interest and a main objective of the SRM and MAP programs is to encourage their use in the private sector.

For many of the most important SRMs and MAPs, the research and development necessary for their production is a high-risk venture taking years of painstaking effort by a highly sophisticated staff. An attempt to recover fully the costs incurred in such a research and development program would price the service far out of the range of the user.

While the Evaluation Panels favor modest and gradual increases in the price of SRMs and MAPs generally, we believe very strongly that the proposed cuts in the 1984 SRM and MAP line items are far too drastic. Perhaps a small, average price increase could be successfully instituted gradually without destroying this vital program of the National Bureau of Standards.

Allow me to give an example of a clinical SRM where full recovery costs would undermine the heart of the program. In 1969, NBS initiated a program to analyze drugs and natural constituents of human serum. The total cost of this program over a 10-year period was $9,750,000, of which about 50 percent was NBS–STRS funds and the other 50 percent was funded by other agencies. Research in this area is a slow process, and it was not until 4 to 6 years later that the first SRM was produced. One of the most difficult (from a research point of view) and important (from an applications point of view) is an SRM that contributes substantially to the safe administration of drugs to epileptic children. It appeared 10 years after the initial program was started. In this case, the incremental cost of producing the SRM is only 6 percent of the total cost of the SRM. If the total research cost had to be recovered, the project would never have been started. There are numerous other examples of SRMs and MAPs where the service is of great value to society but the research costs are high and not recoverable directly in dollars. In such cases the benefits to the health and welfare to our society must also be considered.

Standard Reference Materials normally provide primary standards. However, in many cases, once a primary standard has been successfully produced, secondary standards of much lower cost can then be fabricated commercially and calibrated against the primary standards. When the costs of the primary standards rise rapidly and secondary standards are available, it is expected that the use of secondary standards would increase sharply, resulting in no net gain in revenue from the sale of the primary NBS standards.

As an example of the above, consider the cost of a normal human serum standard, which is now sold as an SRM for $203 per unit. This cost is about 10 times greater than the commercial secondary standard, the quality of which is controlled in part by intercomparison with the NBS standard. To recover the cost of the research involved in the development of this SRM, its price would have to rise to $3,000 per unit. Such a price increase would be expected to drive away many present customers, who would "make do" with the cheap commercial secondary standard. In cases like the human serum standards, its commercial duplication at a greatly reduced cost makes it virtually impossible to sell the primary standard at a high price. There are many instances of SRMs and MAPs for which secondary standards or measurement assurance programs can be developed once the expensive research and development program for the primary process has been successfully completed.

In summary, the process of increasing the prices of SRMs and MAPs is a laudable endeavor, but it has to be done with great care and attention on a case-by-case basis. In this context, I urge you in the strongest terms to restore the SRM and MAP budgets fully, so that a program of increased cost recovery can be instituted in an organized manner. We should pay attention to the long-term viability of this important function of NBS, as mandated by the Organic Act.

COMPETENCE PROGRAM

In my testimony on March 17, 1982, I addressed the great need at NBS for the Competence Program. To summarize that discussion, the Competence Program is needed to guarantee the future viability of NBS in metrology and standards.

The Evaluation Panels for the last decade have expressed concern over the ability of the NBS staff to apply the latest technological develcpments to the mission of NBS in metrology and standards. In this last decade, we have witnessed dramatic advances in computer hardware and software, automation, new materials, and sensors. With a constant staff size and a limited influx of new personnel with new expertise and ideas, it has not been possible for NBS to introduce new technologies and ideas at an adequate rate to meet the needs of the national program in metrology and standards. This limitation on human resources has been further aggravated by inadequate updating of facilities, equipment, and scientific computational facilities, thereby inhibiting the full utilization of available human resources.

To address the problem of upgrading the general capabilities of the human-resource pool, the Evaluation Panels strongly urged the establishment of a Competence Program to bring new expertise into the NBS program. Such a Program was established in 1979 with planned funding increments of $2 million per year to provide a comprehensive, discretionary, in-house research program. The Panels believe that such a competence program is essential for a strong and healthy NBS that can respond swiftly to emerging national needs.

In 1982 the Evaluation Panels were asked to review the Competence Program in depth. The written Panel reports enthusiastically praise the effectiveness and scientific excellence of the individual competence projects that were funded. The Panels believe strongly that the competence money has been well spent. The projects were chosen with great care, and they have been executed with distinction.

In my testimony last year and in the Panel reports themselves, numerous examples are given of major scientific accomplishments under the Competence Program. The program clearly had a highly beneficial impact on the core programs of the National Measurement Laboratory, the National Engineering Laboratory, and the Institute for Computer Sciences and Technology.

On the basis of detailed and in-depth discussions, it was the recommendation of the Evaluation Panels that the optimal size of the Competence Program be about 15 percent of the total NBS research program. The present size of the Competence Program and that projected for the 1984 budget year is about half of the recommended level. In the spirit of the present Administration's support of basic research as an investment into the future, the Evaluation Panels strongly recommend that an increase in the 1984 budget be made in the Competence Program. In the present difficult budget climate, a $1 million increase in the Competence Program at this time could have a major beneficial impact.

EQUIPMENT NEEDS OF NBS

In my testimony last year I discussed in some detail the importance of providing adequate resources for the construction and acquisition of equipment needed to carry out a viable, efficient, state-of-the-art program in metrology and standards. Although many of the important requirements for equipment are now being met, there is still need for major equipment acquistions associated with the redirection or strengthening of programs.

NBS SCIENTIFIC COMPUTING NEEDS

In my testimony last year, I summarized the recommendation of the Evaluation Panels with regard to (1) keeping the computational capabilities of NBS current with the available technology and software developments, (2) staffing the computational facility with NBS personnel, (3) maintaining a viable level of minicomputers and microcomputers for the control of equipment and experiments, and for data acquisition and analysis, (4) instituting a computer network for more efficient use of all NBS computational systems, and (5) expanding the availability and capability of text editors and graphics displays. Further details on these issues were presented in my testimony last year, and the discussion remains valid today.

The Evaluation Panels have continued to address the issue of NBS scientific computing capabilities and needs as a matter of vital and urgent concern. In my testimony last year I focused on the very slow pace being taken toward the acquisition of the central computer facility. The recent Department of Commerce decision to install a powerful central computer on the Gaithersburg site appears to be a step forward. This facility is to be shared with the Environomental Research Laborato-

ries of NOAA. We urge that steps be taken as quickly as possible to implement the acquisition of the central computer facility.

CONCLUDING REMARKS

The National Bureau of Standards provides important services to other Federal agencies and to the private sector. It plays a unique and essential role in the U.S. economy. I believe that the functions of the Bureau will be seriously impaired if the drastic cuts in the proposed 1984 Budget are implemented. Specifically, I urge you to restore funding to the Center for Fire Research, the Center for Building Technology, the Institute for Computer Sciences and Technology, and the Standard Reference Materials and Measurement Assurance Programs. In the spirit of supporting basic research at the cutting edge, I further recommend modest increases in funding in seleced areas of excellence at NBS, areas of great research opportunity, and areas of great importance to the mission of NBS as defined in the Organic Act.

In conclusion, I would like to express my thanks for having been asked to testify before this Subcommittee on these important matters.

Senator GORTON. Thank you very much, Doctor.

Our third witness will be Mr. Richard Bland.

Mr. Bland, your written testimony will be included in full in the record, and you may proceed to summarize, if you will.

STATEMENT OF RICHARD BLAND, FORMER CHAIRMAN, NATIONAL FIRE PREVENTION AND CONTROL COMMISSION

Mr. BLAND. Very well, sir. I am here with a simple task.

First, I would ask the Senate to reject the recommendation to terminate the Center for Fire Research, and to authorize a funding level of $5.8 million as requested by those who know the technical problems and have the capability to approach them.

I would further ask the Congress to direct the U.S. Fire Administration to present a concise action plan that reflects the intent of the Congress when it enacted the Fire Prevention and Control Act of 1974.

Dr. Ambler presented what have been continuing arguments. Apparently the justification for this cut is to decrease the stress on our economical system.

The loss from destructive fire has been and will continue to be a significant stress on our economic system. Reducing economic stress was the intent of Congress in the Fire Prevention and Control Act of 1974. The intent was to provide leadership in managing losses and in reduction of economic stress.

In the last decade the intent of the Congress has been violated. The current budget is tantamount to either an admission, failure, or a lack of capability on the part of my Government to handle such a critical public safety issue. I don't believe that my leaders have feet of clay on such issues.

The external arguments have already been raised. They have historically impinged upon the Federal focus for fire loss management. There are two themes. One is, fire is a local problem. The other is, the private sector can handle the problem.

These arguments have been used for a century and have taken on the aspect of being venerable. They are basically in conflict with each other; neither is conclusive; neither is viable. Neither have been a matter of demonstrated practice in this country or internationally.

Hence, with all respect, I continue to encourage the Congress to recognize the Nation's fire problem as a matter of public safety,

and to use these authorization and appropriation procedures as a means for assuring that there be an objective program, and that the Federal Government exact its performance from its agencies and bureaus.

I will be most glad to answer any questions you may have, sir.

Senator GORTON. Mr. Bland, you were Chairman of the National Fire Prevention and Control Commission. Could you give us your perspective of the role of fire research at the National Bureau of Standards in a national program of fire prevention and control; where does it fit in?

Mr. BLAND. As a physicist, I have always looked with great honor upon the Bureau of Standards.

Fire is a natural phenomenon. It can be neither legislated nor conjured out of existence. To understand fire, one must understand thermodynamics, aerodynamics, heat transfer. Those are the sciences and disciplines that exist within the Center for Fire Research. Further NBS has a community which is scientifically oriented to augment the necessary skills.

If we don't understand fire as a natural phenomenon, there is little hope that we can control its effects in the built environment. There must be a nonvested, scientific engineering approach to the problem that forms the basis for our standards and codes. That understanding is necessary to determine if arson has been committed, or if there is abuse or a misuse of a product or simple ignorance. The basis is science and engineering, and only the Federal Government can handle that aspect of fire with a nonvested interest.

The private sector has historically not been able to handle the problem. The great Chicago fire of 1871 was a specific example of the private sector failure. For more than 100 years there have been requests that the Federal Government take its responsibility, just its responsibility, within the area of destructive fire control. It is discouraging and frustrating. Every administration since 1974 has, for reasons I don't understand, not supported a Federal focus for fire.

Senator GORTON. From your perspective as a professional engineer and as the former Chairman of the Commission, could you comment on the present quality of the work of CFR?

Mr. BLAND. It is extremely high quality. There should be no question about the quality of the present work. There is a question in some minds as to the direction that the work takes. But, fire is a complex problem—technologically, socially, economically—and we do not have the data bases that we need. As a result there will always be arguments about whether toxicity, as an example, is the most critical problem.

If you die from fire, toxicity is a critical problem.

Senator GORTON. What areas would you like to see emphasized and improved within CFR if you had the opportunity to cause such an improvement?

Mr. BLAND. First priority is a data base. There were within the Commission three people that I had and continue to have very great respect for. One was Baron Whitaker, president of Underwriters Laboratories; the others were Percy Bugbee, the retired general manager of the NFPA, and John Jablonski, currently vice president of engineering for the American Insurance Association.

And we sat there as a commission, looking at the fire problem, trying to put it in scope. The current figure at the time was 12,000 deaths. I asked those three to establish the validity of that number. If you are to build an argument on a number you should know its validity. Their estimate was plus or minus 25 percent.

The decisions of what needs to be done on a priority basis have no clear base. There is no statistically valid data system in place today. I understand that the national fire incidence data system is on the shelf. We are involved in the old argument that private enterprise can do it better.

Private enterprise can do a lot of things better than Government, but this is not one of the areas.

Senator GORTON. Thank you very much. Senator Lautenberg?

Senator LAUTENBERG. I think the statement is a very eloquent one and I have no questions.

Senator GORTON. Thank you.

Mr. BLAND. I appreciate the opportunity.

[The statement follows:]

STATEMENT OF RICHARD E. BLAND

As a citizen and a professional in the field of fire prevention and control, I ask the Congress to continue specific funding for the Center for Fire Research at the Bureau of Standards.

In 1971, I was appointed by the President as Chairman of the National Commission on Fire Prevention and Control. That Commission was charged to study the destructive fire problem in this country and to recommend to the Congress how the federal government could constructively act to mitigate the nation's fire losses.

With diligence and understanding, the members of the Commission and the staff prepared a document entitled, "American Burning." As a matter in passing, that was one of a few commissions that completed its work in the time allocated and within the budget provided. It was an honest 110% effort by a concerned panel of experts from the many fields involved in fire loss management.

"America Burning," and the subsequent action taken by the Congress, resulted in the Fire Prevention and Control Act of 1974. The Act established a federal focus for matters relating to destructive fire. The intent was to bring together the many existing fire related activities in a coordinated and objective effort aimed at reducing an unconscionable loss of life and property. The legislation and the organizational form envisioned a shared and cooperative effort between all levels of government. No Valhalla-to-Fire was intended and no regulatory function seems either appropriate or necessary.

Guided by the maxim that a fire safety measure (effectively implemented) must reduce overall losses—not merely convert direct losses such as property damages into indirect losses such as construction, equipment, or manpower costs—the U.S. Fire Administration was structured into three essential activities.

National Fire Data System.—Given limited resources and a problem as complicated as fire loss management, a statistically valid data base is essential to guide the allocation of effort, point to alternative actions, and provide a measure of accomplishment. Without such a reference, capacity and capabilities tend to scatter and, for lack of threshold-of-effort, become ineffective. To be both effective and efficient, the managing entity must gather and analyze the data pertinent to its mission. The federal government was in the optimal position to handle the fire data issues because of its global stature, its access to sources, its expertise, and its clearly nonvested posture.

Research and Development.—The need for information and knowledge was clear to the Commission and a solid data system would better define those needs as well as indicate trends that warrant anticipatory actions. A dedicated R&D effort in technology and human behavior was obviously necessary to provide information for both internal use and for dissemination. The U.S. Fire Administration was to be an informed and readily accessible source of fire related information.

An Academy Function.—Herein was the mission of outreach to the broad and total fire community. That community includes architects, builders, testing laboratories, and public officials (including the fire suppression forces). Intended was a

conduit to those who are faced with the problems of applying the emerging techniques; it was to be an information dissemination and exchange activity using all available and appropriate systems.

Granted, these three activities are conceptual—to some they were idealistic and to others they were a threat; they, nevertheless, formed a structure capable of reducing fire losses effectively, efficiently, and with equity. Further, they are functions uniquely suitable and within the demonstrated capacity of the federal government. They represented a clear cooperative posture.

Evaluated against the goal of significantly reducing life and property loss, what has happened to that structure within the decade is incomprehensible. The results have been discouraging and frustrating but not beyond expectation given the diverse groups that constitute the American fire community.

Perhaps now we should again return to basics to gain composure and provide direction.

I suggest that the accompanying figure schematically presents a goal/needs relationship that must be satisfied if we are to be successful in reducing losses. It is presumed that we agree that goal is worthy as well as within the responsibilities of governments (federal, state, local).

The vertical column on the left-hand side of the accompanying figures expresses the goal—save life and property.

The relationship between the middle column and the column on its left is obvious but it depicts the interrelationships between occupant and property loss control measures. Fire fatalities are a result of a fire; controlling the effects or preventing a fire will affect the life loss and injury rates.

The right-hand column, moving downward, brings more detail. These "oblong blurs" encompass most of the prevailing issues. Feeding each of these objectives is an array of "how to's"; among the how to's and the columns, the interfaces become numerous. It is here that a data system is essential for evaluating alternatives actions against cost-risk and cost-benefit. What is exciting about a "how to" listing is the number of possibilities. Sorting them out by best probability of yield and priority and matching them to capacity and capability is a management challenge. But, be assured—we have no shortage of possibilities. Obviously, we cannot approach them all simultaneously but they are separable by level of government.

I emphasize this separation by level of government because a prevailing theme seems to be that fire is a local issue. Certain aspects can and should be handled locally. A constituency should establish its own level of acceptable risk and be expected to provide the support for that level. For instance, the size and form of a fire suppression force (fire department) should be a local decision. Public safety codes, including fire prevention and construction, are policing actions sovereign to the states and, hence, can be delegated to units subordinate to the states. They are, by definition, local issues. In contrast, no local government should be expected to provide an extensive scientific effort in toxicity, combustion dynamics, compiling nationwide data, or providing R&D as the basis for specifications. Further, localities should have no responsibility in defining what state-of-the-art fire protection practices are required in buildings or facilities provided by the federal government. That is a stewardship responsibility of the federal government by virtue of its trusteeship.

Here, then, is a part of our problem.

"Every level of government in a federal system has exclusive or shared responsibility for providing a wide variety of public services. However, the actual sorting out of functional tasks among different levels of government is a perennial source of tension and uncertainty in American federalism." [1]

To contend that fire is exclusively a local problem is to neglect the broader responsibilities of the total governmental system.

Another issue often brought forward is that the private sector should assume responsibility for public safety in matters of fire. This tends to neglect the stewardship responsibilities of government; and, experience has demonstrated its inadequacy.

George A. Peters [2] makes the following point—

"Within the free enterprise system, economic life is organized in a competitive basis. For example, it is expected that a building will be constructed at minimum cost. Few designers or builders have clients altruistic enough to insist upon including non-revenue producing safety elements unless his competitors also willingly comply. When we say that no one would intentionally design or build so that it would constitute a physical threat to innocent parties, we are moralizing around basic implied safety requirements; 'safety is everybody's business!' Experience indi-

[1] The Advisory Committee on Intergovernmental Relations, A–45, February 1974.
[2] George A. Peters, Product Liability and Safety, Croner Publications, Ltd., 1971.

cates that relying upon purely moralistic safety obligations often results in serious personal injury, property damage, and loss."

There is no doubt that we need product performance specifications and reasonable codes, reasonably enforced. The basis for such specifications and codes is a well understood scientific and engineering practice.

With this background, let us look at the specific issue of the Center for Fire Research (CFR) at the National Bureau of Standards. The CFR is the technology research arm of the federal focus on fire.

Knowledge of the combustion process and its behavior in the building environment is essential to meeting our goals. The basic reasons are:

Fire is a phenomena of nature, hence, its occurrence, growth, and control will be described by such scientific disciplines as thermodynamics, chemistry, aerodynamics, fuel science, and physics. The effects on people are determined in such disciplines as physiology and toxicology.

As a natural phenomena, we can neither legislate nor conjure it out of existence. (The fact is that we could not survive in our present state without the combustion process.)

There is no alternative other than to control the effects of the combustion process.

Returning to the attached figure as a guide, I suggest that this committee and its staff review the work of the Center for Fire Research using the right-hand vertical column as a reference. I believe you will find that CFR has and is working constructively in all areas within its charter. In doing so, CFR has provided a recognized scientific and engineering base for those groups responsible for progressive code generation and adoption as well as a background for the development of performance standards.

In my opinion, the CFR has presented these findings in a professional manner without vested interest and it has acted responsibly as an informed information source to the broad fire community. I am on the distribution list for the Center's scientific reports and I read as many of them as time and personal talents permit. I use the file as reference material for graduate students and in providing information to communities, industries, and other interested parties through the Pennsylvania Technical Assistance Program.

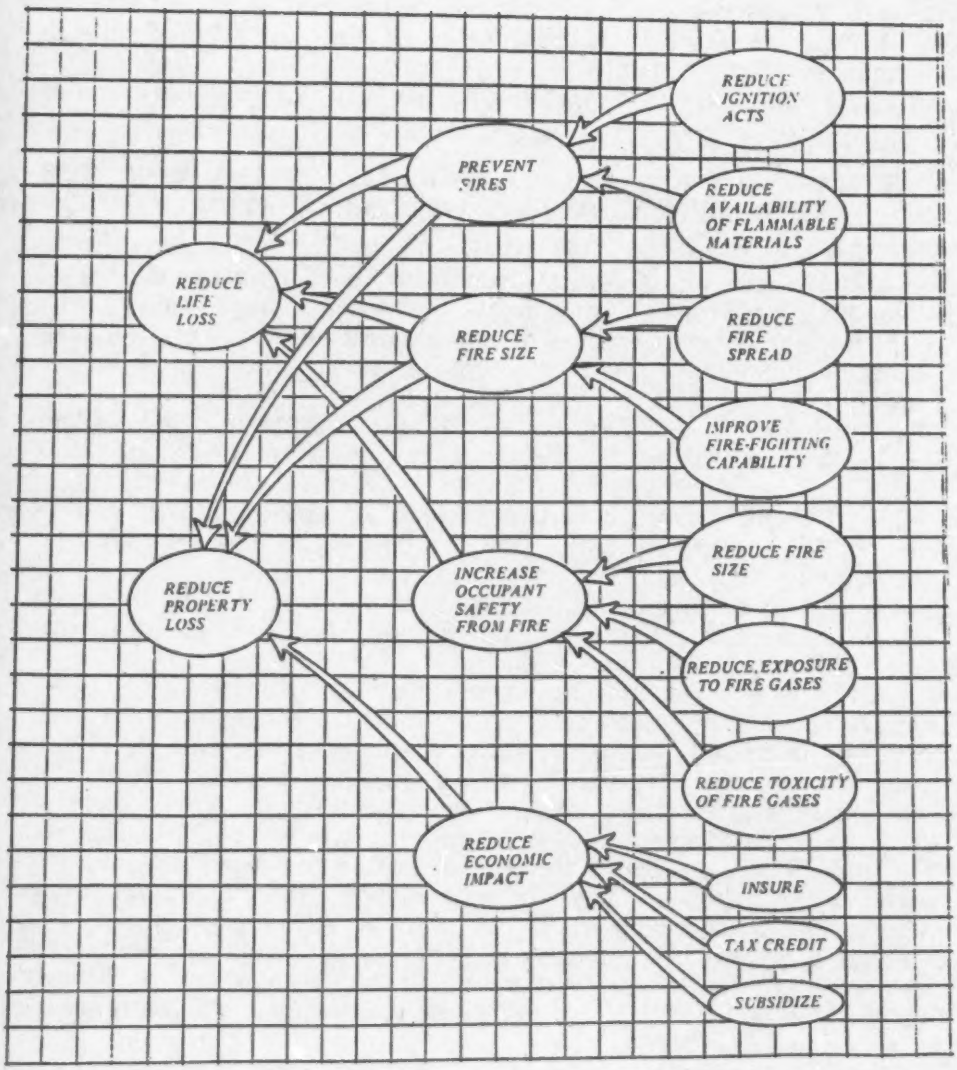
Although there are those who criticize the CFR work for its lack of direct relationship to "real" fire problems, I find that unjustified.

It is my view that the proposal to terminate the Center for Fire Research is another in a series of manipulations (motivation unclear) by which the federal government is attempting to divest itself of visible concern for the fire problem. Prior to the recommendation for termination of CFR, I have seen the National Fire Data System set aside and have observed the submersion of the U.S. Fire Administration into the Federal Emergency Management Agency. The result of the latter was a lack of visibility for a safety problem that affects thousands of persons daily, destroys the products of our present and past labors, threatens our resources, and costs billions of dollars annually in direct and indirect costs. Such a problem needs a dedicated effort and a visibility to the general public.

Through my forty years of involvement as a fire fighter, including the unique privilege of participating professionally at all levels of government, I have come to appreciate the complexity of this nation's fire problem. It is clear that if leadership toward fire loss management is not taken by responsible governments, then we shall become increasingly threatened as our technology produces more fuel and ignition sources, our population increases, and our structures age. Scientific and engineering understanding of fire is essential to its control.

Therefore, I urge the Senate to reject the recommendation which terminates basic fire related research efforts within the federal government and then ask it to turn its thoughtful direction toward again devising ways and means to reduce life and property loss from destructive fire.

I continue to be confident that goal can be accomplished without significant additional burden on any sector of our society; the undiminished need for a visible cohesive federal focus for matters of fire continues.



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Senator GORTON. Our final witness at this part of this hearing is Mr. Jack Biddle from the Computer and Communications Industry Association.

Senator LAUTENBERG. Here we are, Mr. Biddle, on opposite sides of the desk.

STATEMENT OF A. G. W. BIDDLE, ON BEHALF OF THE COMPUTER COMMUNICATIONS INDUSTRY ASSOCIATION

Mr. BIDDLE. Thank you, Mr. Chairman. In light of your time constraints, I would like to simply touch on the five questions that I set forth in my prepared statement. These are five questions that I would hope that the members of this committee would try to develop some solidly based answers to before determining which way to proceed with the ICST budget.

The principal focus of my comments pertains to the ICST budget because it is one of vital importance to my 70 member companies and, I think, to our industry.

First, I think you need to take a look at why standards in this industry are important. Right now, by best estimates, the information industry represents some 47 percent of the gross national product. It is becoming all-pervasive throughout our society, not only in business but is also quickly moving into the home in a variety of fashions.

In the last few years, we have seen an improvement in the quality of telecommunications services for data transmission and a lowering of the price of those services to where we are now in a completely different world of data processing than we were when Mr. Lautenberg started his company. I suspect in the early days of automatic data processing in his company, trucks brought information to the door, the computer processed it, and trucks took it back to the user. Today we do all of that by telecommunications links.

Today Mr. Lautenberg could not move a truck up to the loading dock on a Saturday night and replace an entire data system and resume production Monday morning. In the early days of this industry, he could do that, as long as he bought all of his equipment from one manufacturer.

We need standards because this industry is becoming a conglomerate of computers, communications, graphics, devices, automated machine design, and robots. These devices must talk to each other. They must be compatible at the interface. We are not suggesting any organization should impose on the private sector specifications on how to design a black box to perform a function, but someone must perform the job of developing a rational set of specifications and protocols to allow two black boxes of two different manufacturers to work in harmony with each other.

If that is not accomplished, the information age, which will supplant the manufacturing age in importance to this country, will literally be a Tower of Babel and chaos.

Who should set standards? The private sector should set standards. But, gentlemen, the private sector will not set standards. This is one of the very few industries where the consumer has not used his purchasing power to ordain that the manufacturers put their heads together and eliminate some of these problems of incompati-

bility. The user, with the sole exception of the Federal Government, has largely been passive. He has not exerted his economic influence on the recalcitrance of the industry.

What happens if we do not have standards? Mr. Lautenberg alluded to it. Basically we will return to the monopoly status in which this industry started some two decades ago. If I can unilaterally control the standards by which devices work with my devices, and I have a majority or dominant share of the marketplace, and if I can change those standards any time somebody comes along and threatens my market position, I will maintain and enhance that market position over time.

Frankly, if we do not have standards, we find ourselves in a continual state of forcing a consumer into using products that are obsolete, and, frankly, the Federal Government is the biggest single example of that. The Federal Government's inventory of ADP equipment is heavily obsolescent and largely because of the lack of standardization in computer languages, which would have allowed the Government to migrate into new, better, more cost-effective equipment.

It is wasteful not to have standards.

What role do standards play in our international competition? It is vital. Foreign competitors today are under Government direction, using standards just as dominant firms in this country have historically used standards as a method of controlling market share, eliminating competitive entry into their markets.

The United States, as it now stands, does not have, with the exception of ICST, an effective body to participate in the international data processing standards process. ANSI, the voluntary group, is not accredited to ISO and the other international standards organizations. Our international competitors are generally represented by employees, often of federally owned and controlled corporations who in turn are taking their direction from the policymakers who see the information industry as the wave of the future, as a nationalistic effort.

Our competitors overseas have realized that by coming to this marketplace with a standardized product they will benefit. More importantly, we have the problem that if they standardize on a product which is different than the U.S. standard or there is no U.S. standard, the U.S. manufacturer is effectively precluded from the overseas market unless the U.S. manufacturer is willing to be a shortrun producer, destroying its economies of scale and becoming a less effective international competitor.

Why must the Government be involved? Basically two reasons. One, because the Government today is spending approximately $20 billion a year on data processing and data communications and telecommunications as a major buyer of our industry's products and services. You have an obligation to spend a few dollars to buy our goods and services, $20 billion worth, intelligently and prudently. Second, the private sector, frankly, has blocked standardization.

The final question that I wish to address is what is behind the effort to eliminate ICST. I would suggest to you gentlemen that there has been a massive lobbying effort on the part of a few dominant manufacturers who have observed the success of ICST during the 3-year period since 1979, when this committee, the House Gov-

ernment Operations Committee, and our association worked to increase ICST's budget from $4.5 to $11.5 million.

During those years ICST has become increasingly productive. They have attracted good talent. They have been able to keep good talent in spite of industry's much higher wage scales. They have begun to do a good job and, frankly, it scared the hell out of a few dominant firms in this industry and they have been to OMB and they have said this is a form of regulation; it has got to stop.

Well, gentlemen, it is a productive form of Government effort, but ICST does not regulate anything. They do, in their capacity as a developer of FIPS standards for the Federal Government, serve to minimize future chaos in the Government sector. That is an appropriate role and the courts have ruled that the Government has a right to impose a standard. If the industry does not want to build to that standard, the industry is free not to. But if they want to compete for Government business and the Government wants to standardize an interface, they have that right.

I think if you would look at the long term benefit to the Nation, both internationally and domestically in the utilization of our industry's products, you will find that the role of ICST is not only vital, but, frankly, the budget ought to be doubled or tripled.

If it is going to continue to remain as this political football, I would frankly like the opportunity to meet with this committee and talk about alternative homes for this function, through a Federally chartered corporation that would take it out of the political arena and give it the power and the ability and the budget to do its job.

Thank you, sir.

Senator GORTON. You have spoken glowingly of the positive work ICST performs in international standards. Now turn it around and assume the budget cut which is proposed here. What would be the consequences of that kind of reduction be on ICST's international activities in the standards area?

Mr. BIDDLE. I was surprised, I think, that Mr. Ambler thinks they can continue to be effective in the international standards area with a budget cut. In the first place, part of their ability to work in the international area is their heavy work in the volunteer arena. It is here where they find out what the manufacturers are doing, think they can do, and what they do not want to do and why.

And with that information then they are able to represent our interests internationally. You know, a $4.5 million budget to represent this country's international interests in what is rapidly becoming a $120 billion industry, of which 30 to 40 percent is export trade, is foolish.

You know, I sit as a congressional educator in Washington and keep shuddering at the fact that agriculture is 2 percent of the gross national product and nobody dares cut their budget by $4.5 million, if it had something to do with growing wheat, and yet here is an industry that is 47 percent of the gross national product is a penny-ante game. I do not understand it.

Senator GORTON. Thank you.

Senator Lautenberg?

Senator LAUTENBERG. We come from a similar background and obviously we are objective with our bias. The fact of the matter is that Mr. Biddle and I have known each other for some years and it was not too long ago that I was on that side of the table testifying before the Banking Committee on banks and their development in data processing.

I was president of an association called ADAPSO—the Association of Data Processing Service Organizations. We are going to agree on lots of things here because I think that Mr. Biddle's statement was not only articulate but was honest in terms of his brief recount of the history of our industry, when there was such total dominance which could be forced by a specification that no one could match. Then we had a different kind of an industry.

Today you said 47 percent of our GNP is generated through information services. We know that more than half of our work force today in America—has been for some time—more than half is in the white collar or what would be considered the information sector. So we are looking at a change in our economic and professional lives of a major magnitude and we ought not to lose this opportunity. I think we will lose it unless we are vigilant about how we protect it.

I also agree with something else that you said—and, Mr. Chairman, I did not know whether we were going to have any witnesses from the manufacturers, from the major manufacturers——

Mr. BIDDLE. I represent some fairly major manufacturers.

Senator LAUTENBERG. One of my questions was going to be, if you do not mind, to state who some of your large members are, please.

Mr. BIDDLE. Wang, Lear Siegler, Perkin-Elmer, Mohawk Data Sciences, Harris Corp., Lexitron, CPT—a wide variety—some of whom are guilty of just what I have described in my testimony.

Senator LAUTENBERG. Well, in all candor, IBM is not, Honeywell is not.

Mr. BIDDLE. No.

Senator LAUTENBERG. Burroughs?

Mr. BIDDLE. Basically, IBM and what we refer to as "the bunch" have found that the lack of standardization allows them to maintain a stable market share over time. The market share of those six firms has almost remained constant since 1952.

Senator LAUTENBERG. You obviously feel that the ICST has a major role to play. Is money the only thing that they need, or are there some institutional reforms that maybe ought to be made?

Mr. BIDDLE. Well, it is my own personal opinion, and I have been wrestling with this problem for the best part of the 10 years I have been in Washington, with the convergence of computers and communications, I think we need an institutional organization that is empowered by Congress to represent this country internationally with respect to both computer and communications standards.

The restructuring of the Bell system will result in one of two problems—either through the establishment of this huge central staff organization and through that the continued maintenance of standards and protocols for the telecommunications network and the perpetuation of the AT&T monopoly, or chaos because they will not be allowed to perform the function. the preferred solution is a

new institutional vehicle developed and promulgate the needed standards.

With the convergence of computers and communications, we need both sides of that interface involved in that process. So what I have suggested is that we charter an entity similar to the Financial Accounting Standards Board or the Smithsonian where it is governed by an impeccable Board of Governors drawn from both industry and Government and the user community, where it is funded by those three entities, where it is empowered to represent us internationally, which the Department of State cannot do because they do not have the link with the industry, where it has the manpower and the budget to develop anticipatory standards that are needed before market positions become the controlling factor in whether a standard is going to be accepted or not.

The voluntary standards process works so slowly that by the time one has developed one or more manufacturers have a significant portion of the market and at that point do not want a standard because it makes other products easier to compete with theirs.

So I would like to meet with your staff and determine if there might be some better way. ICST has been an orphan at the National Bureau of Standards. They have talked about moving it over to Commerce or to GSA. There is not another part of Commerce that has the political stability to provide the long-term vision that this organization needs.

At GSA, ICST would get enmeshed in the procurement process. The role it has been playing is not just in Federal procurement but it has been playing a major role in increasing the productivity of our industry's products through the private sector as well as a by-product of more intelligent Government utilization.

Senator LAUTENBERG. It is fair to say, Mr. Chairman, I think even in Government, even in the Senate, that computerization could be more effective. We will let that pass for the moment.

Mr. Chairman, I will restate that I have heard that it is even possible in the Senate that we could have more effective use of computers in terms of the way we function. Is that true? You have been here longer than I.

Senator GORTON. I think there is no question about that.

Senator LAUTENBERG. That helps me make Mr. Biddle's case. The fact of the matter is that we are looking at such a large part of our national product and a large part of our national opportunity. And again I keep saying that it is going to affect the sociology of our society very significantly. The results of that are not at all discussed, in my view, in rational form although they are going to be enormous.

They can affect transportation systems, educational systems, library systems and obviously, research systems. We will be changing institutions radically. I frankly think—and I tried to say it before and you were very emphatic about it—this is a pitfully small sum, even at its present full budget, for coordinating the kind of industry and the kind of national opportunity that we are dicussing in the information sector of our society.

I am concerned, frankly, that the Director of the National Bureau of Standards does not share the point of view that professionals—and we talk about Dr. Dresselhaus and others—have in

terms of encouraging a larger expenditure. I think the Bureau is missing the boat there.

Do you think, Mr. Biddle, that cutting the ICST budget is consistent with a national policy of promoting science and technology?

Mr. BIDDLE. It certainly is not, Mr. Lautenberg.

Senator LAUTENBERG. That makes two of us.

Thank you very much, Mr. Chairman.

[The statement follows:]

STATEMENT OF A. G. W. BIDDLE ON BEHALF OF THE COMPUTER AND COMMUNICATIONS INDUSTRY ASSOCIATION

Mr. Chairman, Members of the Subcommittee, my name is A.G.W. Biddle. I am President of the Computer & Communications Industry Association (CCIA), an organization comprised of the chief executive officers of some seventy leading manufacturers of computers, data storage system, data terminals and telecomunications equipment and services. Together our member firms generate approximately seven billion dollars in annual revenues in these products and employ several hundred thousand U.S. citizens. I think it is also significant to point out that our member companies export about three billion dollars a year worth of our industry's products, and collectively pay over three hundred million dollars in taxes on corporate profits into the U.S Treasury. Furthermore, these firms are growing—during normal times—at a rate of 25 percent to 30 percent per year.

I have asked to testify before this Subcommittee because I am vitally concerned about the role that the Institute of Computer Sciences and Technology must play in the long-term health and vitality of our industry—both in the U.S. and overseas.

The thrust of my statement deals with six main questions. These are:

Why standards?

Who should set them?

What happens if we don't have standards?

What role do standards play in our international competitiveness?

Why must the Government be involved?

What is behind the effort to eliminate ICST?

My focus in attempting to provide answers to these questions will be on the computer and telecommuncations industries, because this is where the need for appropriate standards is greatest and where I believe I have some expertise.

WHY STANDARDS

As you know, the computer industry for all intents and purposes is less than thirty-five years old. During the first half of that period, data processing was highly centralized. We all remember the glass enclosed, air conditioned "IBM" room. Shopping carts full of information were trundled into a room full of key punch machines and operators, the data converted to punched holes in cards and fed to the computer for processing. In due course, reams of paper were produced and distributed back out to those who needed information. Typically, the equipment used was designed, manufactured, installed and maintained by a single supplier. In the truest sense, it was bundled and tied together by pricing and technical strategies intended to lock the customer into a sole source relationship with the vender.

The manufacturer established the internal standards to facilitate the interconnection and interoperability of the various elements of its system and sought to minimize possible interchangeability or interoperability with devices or systems produced by competitors. The centralized and isolated nature of data processing at the time imposed few penalties on the end user as a consequence of the lack of industry standardization of the interfaces and protocols needed to allow compatibility between systems and devices. Similarly, the high cost and poor quality of available datacommunications circuits limited the amount of data transmission taking place, and thus limited the need for protocols and standards to cover such things as message formats, data encryption and transmission protocols.

By contrast, over the past decade we have seen our technology move us into a new world of distributed processing with an ever growing need for the movement of data between large computers, desk top "personal" computers, word processors, printer/copiers and industrial robots through terrestrial and satellite circuits across town and across continents.

These complex networks cannot function without standard interfaces, standard protocols and standard computer languages. Without all three there is chaos. The

requisite standardization can take place in but one of two ways. Either the dominant firms in the industry, in this instance IBM and AT&T, unilaterally establish de facto standards for the interoperability of their respective product lines and the user, be it private sector or government, limits his procurements to a single vendors' product line for all of his needs; or alternatively the industry could, through the voluntary consensus standard-making process, develop the necessary standards to allow the user to procure the best devices available from a variety of vendors and be assured that they would be able to function efficiently as part of an integrated system. One would like to assume that our industry would have opted for this alternative and, having made the application of our products easier for the end user, seen the market expand even more rapidly than it has. Unfortunately, I have to report that our industry has a propensitity to shoot itself in the foot when it comes to the establishment of standards.

While the voluntary standards process drags on, often for a decade or more, the dominant firms impose a de facto standard upon the user community that then serves to perpetuate the dominant firm's position in the marketplace. The lack of an industry standard serves to protect and perpetuate the market share held by each participant and restricts new participant entry by breaking the market into small segments that are uneconomic to enter.

The result of all of this is chaos and confusion for the user. My word processor can't talk to your word processor, and in all probability my computer can't communicate with your computer, nor will the program you write for your computer run on my computer.

In other, more mature industries, the consumer would have used his or her purchasing power to bring a halt to such rampant inefficiency. In this one, the consumer, with one possible exception, has been passive and done little to pressure the industry into developing and implementing the standards that are so desperately needed. That one exception, which I will comment on further later in my testimony, is the U.S. Government in its role as the single largest user of our industry's products.

WHO SHOULD SET STANDARDS

Ideally, the manufacturers of computer and communications equipment and the users of their products should join together to develop the standards necessary to provide compatibility and interoperability. However, as now constituted, the voluntary standards process mitigates against this. First, as I noted before, many of the larger manufacturers don't want standards for fear that the additional competition that would result would erode their respective market shares. On the other hand, the user community generally lacks the technical expertise and the patience to effectively participate in the process. Consequently, they tend to default to the manufacturers, even though to do so is counter to their own best interests.

The exception to this pattern has been the U.S. Government which expends about 10 billion dollars per year for ADP. Under the aegis of Public Law 89-306, the Brooks Act, ICST has been delegated the responsibility to develop and promulgate standards for use by the Government in the procurement and application of data processing equipment and to provide technical assistance to Federal agencies in their use of ADP resources.

It is in this capacity that ICST played a leading role in the development and adoption of vitally needed standards in the areas of data encryption, central processor to peripheral device interfaces and protocols, and data communications standards and protocols. While carrying out their Brook Act mandate, ICST has also made a substantial and increasingly important contribution to the entire community of users in the private sector. As a result, a very small Federal expenditure has been leveraged in three important ways. First, the Government's use of computer and communications technology has become more effective and efficient. The flow through of these improvements to private sector users has in turn spread the cost of implementation across a substantial portion of our industry's output, rather than only the Government's 7 percent share. And finally, the improvement in efficiency and productivity of the private sector user community increases our domestic efficiency and international competitiveness.

These gains have been a direct result of ICST's leadership and of the active participation by highly qualified ICST personnel in the voluntary standards process.

1. Through ICST's involvement, the government, as a major customer of the industry, is better informed as to underlying technological developments and trends.

2. The presence of ICST personnel accelerates the standards making process by making it more difficult for some manufacturers to employ delaying tactics for self serving purposes.

3. The implied threat that the Government, through ICST, can and will develop its own standards if the industry fails to when it is in the taxpayers' interest is in and of itself a major incentive toward the formulation of voluntary standards.

As I noted earlier, the preferred solution to the computer and communications industry's standards problem lies in a cooperative effort between the producer community and the user community. However, until the private sector user community recognizes that the inefficiencies that result from incompatibility between systems will be eliminated only through a refusal to purchase the incompatible product, the Government has an important role to play. Part of that role is to insure that the necessary standards are in place to provide compatibility and interoperability between federal computer and communications systems and subsystems. Another part is to insure that our rapidly developing information technologies contribute to our total national welfare.

WHAT HAPPENS IF WE DON'T HAVE STANDARDS

The lack of standards during the early part of our industry's history served to lock the user into the products of a single vendor and to restrict his migration path only to new and larger systems provided by original supplier.

In today's world of interactive real-time networks this has become an extremely serious problem. No vendor is capable of being all things to all people. Of necessity, the user must be able to integrate and efficiently use systems made up of products produced by a multitude of producers. That user must be able to adapt the system to his needs on an evolutionary basis. Without the requisite standards, this is impossible. Without standards, each manufacturer's product is an island unto itself contributing to the tower of babble that is now the information age.

THE ROLE OF STANDARDS IN OUR INTERNATIONAL COMPETITIVENESS

Just as a few dominant firms in our industry have recognized the role that control over standards plays in obtaining and maintaining market share, so have our rivals in the international marketplace. France, Germany, Japan and England have all embarked on agressive Government-financed programs to develop and implement various data processing and telecommunications standards aimed at enhancing their respective world market shares. The success of the Japanese in virtually monopolizing various U.S. consumer goods markets has resulted from the early developing of standards under the auspices of their government, and then penetration of world markets as a consequence of large economies of scale based on that standardization.

As these national strategies are implemented, U.S. computer and communications equipment manufacturers will find it increasingly difficult to build to serve the U.S. market and also to serve overseas markets that are governed by inconsistent standards.

ICST has been playing an extremely important role in the increasingly important international standards arena. The representatives to the international standards bodies from the other industrialized nations are government sponsored and typically are employees of government-owned organizations with close ties to the international trade policies and objectives of the sponsoring country. The United States has no counterpart to participate in this process. The American National Standards Institute (ANSI), the umbrella group to the voluntary standards community, has no official status. The Department of State, which has the power to represent the United States in such international meetings, has little or no technical competence nor an ongoing communications link with the private sector.

At the urging of this Committee, ICST has successfully stepped in to fill this void and become an able and effective representative for U.S. interests in the international standards arena. Had they not done so, I am confident that our industry's now very positive balance of trade would already be seriously eroded. I believe that it is vital that this effort go forward and that additional resources be focused on the creation of a unified set of standards and protocols for the efficient use of our industry's goods and services both domestically and internationally.

WHY MUST THE GOVERNMENT BE INVOLVED

First, because huge savings have and will continue to be made through the intelligent utilization of our industry's goods and services for the management and oper-

ation of the Government itself. I would estimate that the Federal Government spent in excess of 10 billion dollars for data processing equipment and services and at least another 10 billion dollars for telecommunications last year alone.

The opportunities to improve the return on these investments, enhance the delivery of Government services, and increase government efficiency are tremendous. The General Accounting Office, on more than one occasion, reported millions of dollars of savings that can or have directly resulted from ICST's efforts and output.

It would seem to be extremely short-sighted to reduce or eliminate for budgetary reasons ICST activities which have been demonstrated to directly save the taxpayer many times over the dollars expended. Ten million dollars per year to more intelligently procure and utilize 20 billion dollars a year worth of goods and services seems to be an extremely small price to pay for all that has and can be attained.

Furthermore, ICST's activities flow to the benefit of private sector users and contribute directly to significant gains in efficiency and productivity virtually everywhere our industry's products are used. These gains in productivity in turn flow back to the Government in the form of new jobs and increased tax revenues.

WHAT IS BEHIND THE EFFORT TO ELIMINATE ICST

Although the principal responsibilities of ICST were legislatively established in 1964 with the enactment of the Brooks Act, the organization was funded at a level below $4.5 million through fiscal year 1978. As a result of efforts by your Committee, the House Government Operations Committee, and our Association, the Institute's budget was increased to $11.2 million in fiscal year 1979.

At last ICST was able to assemble the qualified technical talent and requisite support equipment to address the myriad of standards-related problems facing the Government as a user. During the past five years substantial progress has been made toward identifying the impediments to the efficient use of computer and communications technologies, encouraging the private sector to develop needed standards on a timely basis through voluntary consensus and, when necessary, adopting Federal Information Processing Standards (FIPS) when the private sector drags its heels to the detriment of the Government as a user.

As noted earlier, a few of the larger producers in this industry seek to stabilize their market share through the maintenance of product differentiation at the interfaces between their hardware and software. This maintains a technological bundle and ties the offerings of a vendor so that a competitor cannot offer a compatible product.

The fact that ICST has become increasingly competent in performing its assigned mission has disturbed some of the producers and led to a substantial lobbying effort aimed at elimination of the Institute. The proposed budget that you are now considering is, I believe, a direct outgrowth of that lobbying.

The opponents of ICST contend that they are merely trying to eliminate one more unnecessary Federal regulatory activity. The truth is ICST performs no regulatory function. It does, by Congressional mandate, seek to increase the efficiency of the Government's use of data processing and telecommunications equipment and services. The courts have clearly stated that the Government has the right to establish specifications for the products it procures, and the private sector has the right to refuse to compete for the Government's business if it finds those specifications onerous. The success that ICST has achieved to date in moving towards increased compatability and interoperability of information systems threatens the entrenched position of a few vendors and has resulted in this effort to eliminate the perceived source of the problem.

Similarly, the vital role that ICST has in the international standards area is of no great import to those who seek to eliminate ICST as those companies largely manufacture overseas what they sell overseas and are thus not seriously threatened by a proliferation of standards that are unique to each country. But if the United States does not effectively participate in the setting of international standards, the several thousand smaller U.S. firms that export from U.S. plants will be driven out of those markets and their market shares absorbed by the dominant firms. If this effort to reduce ICST's budget and effectiveness is successful, it will result in significant domestic job losses in our industry and a substantial reduction in our industry's current $7 billion positive balance of trade.

IN CONCLUSION

The convergence of computers and communications and the rapid dispersion of computer technology into every business, and soon every home, in America requires the timely development and implementation of both hardware and software stand-

ards to protect the integrity of data, permit its rapid movement between systems and subsystems, and allow the user the opportunity to optimize his or her network or system to his or her specific needs.

An organization must be in place with the stability and resources necessary to monitor developments in the underlying technology, identify evolving user needs and work with the industry to develop the necessary anticipatory standards before entrenched market positions block their adoption. This same organization can and should provide the means to resolve standards issues between manufactuers in a manner that conforms with the intent of our antitrust laws. It should also have the resources and authority to represent U.S. interests before international standards organizations.

The nucleus of the organization I have described exists in ICST. Instead of cutting its budget by more than two-thirds, we should be increasing it significantly. Dollar-for-dollar it is one of the most productive expenditures the Federal Government makes.

Thank you.

Senator GORTON. Thank you very much, Mr. Biddle. That terminates this portion of the hearing. We have a second hearing to follow immediately on the subject of the Fire Prevention and Control Act 1984 authorization.

[Whereupon, at 11:04 o'clock a.m., the subcommittee adjourned, to reconvene immediately in a further hearing.]

ADDITIONAL ARTICLES, LETTERS, AND STATEMENTS

Statement of Dr. Larry Feeser, Chairman, Technical Activities Committee, American Society of Civil Engineers

The American Society of Civil Engineers is the volunteer professional organization advancing the science and technology of civil engineering. As Chairman of the ASCE Technical Activities Committee it is my duty to identity to the Subcommittee the irreparable harm which will occur should the proposal to eliminate funding from the National Bureau of Standards budget for the Center for Building Technology and Center for Fire Research be approved. The proposed fiscal 1984 budget of the United States government does a great disservice to the American Public and to the building community by suggesting that the vital research performed by these organizations can and will be replaced by the private sector. Indeed, it is the opinion of the American Society of Civil Engineers that these programs must be continued and that specific budget authorizations for each Center should be included in FY84. The specialized laboratory facilities and equipment and the comprehensive abilities of the professional staffs of the Center for Building Technology and Center for Fire Research constitute public resources which should be more fully tapped and not arbitrarily diminished by shortsighted budgetary concerns.

The Center for Building Technology, which performs field, laboratory and analytical research to develop measurement techniques and to evaluate the properties of buildings construction materials, components and systems, cannot be replaced by proprietary research programs. As civil engineers, the members of my profession need sound technical information to make responsible and cost effective decisions in the building process. The Center for Building Technology provides such information in a way that no private organization can. The American Society of Civil Engineers or other nonprofit organizations cannot replace the technical abilities and professional experise of the CBT; the private sector neither can nor would be inclined to fill the major void created by eliminating the Center for Building Technology.

In addition to being the principal source for the necessary information which allows the development of voluntary building standards, the Center for Building Technology research provides other benefits which far outweigh its costs. Perhaps the most important of these is that it establishes the technical information which allows policy makers to reduce the burdens of unnecessary or ineffective regulations while assuring that the safety of the public is preserved. And it is impossible to consider the Center for Building Technology without acknowledging the role it has served as the neutral laboratory investigating major building and construction failures, identifying the technical causes and publishing the results to educate the public and the building industry. This Subcommittee should also recognize that without a specific budget authorization, the Center for Building Technology would be incapable of providing the authoritative laboratory support for Federal agencies which need assistance in developing criteria for the design, construction and maintenance of their facilities. Although we cannot offer a financial analysis, it is highly likely that technical support from the CBT provides the Federal government with saings in the life-cycle costs of its buildings which annually exceed the budget authorizations for the Center. To not provide a specific level of new funding for the Center for Building Technology would be to ignore a productive investment opportunity.

The Center for Fire Research also contibutes to public safety in a way that no privately funded research effort could. The research and evaluation work of the Center is illustrative of a cost-effective basic capability which should be promoted by the Federal government. The termination of this important life-safety fire research essentially would stop the development of fire control technology in the United States. And, if the specter of eliminating life-saving opportunities does not deter efforts to zero-fund the Center for Fire Research, the cost-saving opportunities should persuade a budget conscious government to reconsider the proposal. Fire-safe building design techniques can save money for all sectors of our society. Without the Center for Fire Research, fundamental research programs will stop and engineering

criteria no longer will be generated. Again, such a short-sighted budget approach is deleterious to the economic interests of the American people and threatens the lives of all of us.

From the perspective of the professional expertise of civil engineers, the prospect of eliminating the Center for Building Technology and Center for Fire Research is tragic. We suggest that specific authorizations for each Center, at a minimum of the fiscal 1983 levels, are called for and urge the Subcommittee to allow the Centers' vital work to continue.

STATEMENT OF THE NATIONAL FIRE PROTECTION ASSOCIATION

The National Fire Protection Association (NFPA) expresses its concern over the Administration's FY '84 budget proposal that would provide zero funding for the Center for Fire Research (CFR) within the National Bureau of Standards (NBS) and, thus, eliminate this important scientific research unit within the Federal Government.

The NFPA, founded in 1896, is a non-profit, technical and educational membership organization. It has remained the principal public advocate for fire safety since its inception. The Association's membership of over 32,000 is drawn from the many disciplines involved in, and concerned about, the national fire problem. NFPA is not a trade or industry association. No one group or interest is dominant. The only common membership denominator is a concern about fire safety. Members include fire service personnel, fire marshals, electrical inspectors and city managers; architects, engineers and educators; health care facility operators and similar groups from commerce, industry, insurance and the Federal Government. The NFPA is best known for its voluntary safety standards, collectively known as the National Fire Codes which, in whole or in part, are incorporated by reference into numerous federal and state laws and into municipal ordinances.

The proposed elimination of the NBS Center for Fire Research follows the Administration's FY '83 proposal to eliminate the United States Fire Administration (USFA), which is presently located within the Federal Emergency Management Agency.

Thanks to unanimous action by this Committee and by the appropriations committees. although curtailed and redirected, the USFA was saved. This year the elimination of the Center for Fire Research is being proposed at the same time that reauthorization for the USFA is being sought.

In NFPA's view, the existence and continued functioning of both the USFA and the NBS Center for Fire Research is essential. Historically, the NBS has had a fire research capability since 1904, at which time standardization of fire hose couplings was at issue. In subsequent years, the Fire Resistance Section had been established within NBS, and in 1968, with the enactment of the fire Research and Safety Act of that year, the organization was formalized. Subsequently, Section 18 of the Fire Prevention and Control Act of 1974 amended the NBS Organic Act thereby creating the Center for Fire Research in its present form.

It would be a mistake to view the workings of the NBS Center for Fire Research as simply abstract, scientific experimentation. Although the Center is a community of scientists and engineers and much of the work is, in its initial form, relatively abstract, one of the distingushing features of this particular part of NBS is that the Center goes beyond this initial research to produce practical tools which have great benefits.

For example, the Center began fundamental studies of residential smoke detection in 1972. At that time, home smoke alarms were virtually unknown in this country. Two years later, a test method for residential detectors was published by NBS and adopted by Underwriters Laboratories as the basis for that organization's certification and labeling program. These developments set the stage for the explosion of smoke detector sales in this country. Now, less than ten years after the Center's first inquiry, two out of every three homes in the United States has this life-saving device. In NFPA's judgement, that would not be true if it weren't for the pioneering work of the Center for Fire Research.

One reason we feel safe in most buildings is that we are fairly confident that a fire will not cause them to collapse before we can get out. Building don't just happen to be built that way—the concepts of fire endurance, which are the bedrock of modern fire protection, were developed at NBS fifty years ago.

When you go home this evening, take a moment to look at your carpet; work completed at NBS in 1970 has ensured that carpet manufactured since that time will not ignite from a dropped match or similar small ignition source.

No mattresses sold legally since 1973 will ignite from a cigarette—again thanks to work done at NBS.

There is scarcely an area of practical fire protection which does not show the imprint of work done by the Center. Fire fighters today wear improved protective clothing; buses, subways, trains and airplanes are more fire safe; hospital and nursing home fires are increasingly uncommon—all due to research done and put to practical end use as a result of the work of the Center for Fire Research.

NFPA doesn't think anyone can seriously suggest that the Center doesn't earn its keep—a single famous hospital in Massachusetts saved more money by applying CFR-developed fire protection technology than it costs to operate the Center for eighteen months. Rather, the issue is whether the private sector can do as well or better in providing this technology. In our view, it cannot—in fact, it can't even come close.

It takes money to do this work, and in the private sector, one cannot spend money unless there is a clear financial return. Safety standards, such as those of NFPA, invariably involve product exclusions. This means that the research that often underlies the standard must be technically sound and free from bias. Even when privately funded research meets these tests, the conflict level that accompanies standards development will be raised. That level is already high, and the risk is run of having fire safety being finally determined in the courtroom, not the laboratory. By the same token, the costs of standards development would increase dramatically.

The crucial and irreplaceable element that NBS brings to the fire safety community is credibility. Private funds doing the same research, just as well, could not have the same impact.

Furthermore, the Center is an interdisciplinary organization. No single industry would be willing to support such a diverse collection of specialties. Yet, without that diversity, the breakthroughs are not going to be realized.

For example, mention was made that the Center had developed cost-saving technology for hospitals. That involved the concept of the Fire Safety Evaluation System (FSES) for Hospitals and Nursing Homes, a concept that is now also part of the National Fire Codes. Using this system, building owners and developers can meet code requirements with far more flexibility and, therefore, at much lower cost than was previously the case. The savings potential for health care facilities alone in the United States is in the billions—and comes at a time when other health care costs are skyrocketing. On one hand, the Center had assembled the physicists, psychologists and engineers to compare and evaluate fire protection methods and, on the other, the Center had the credibility in the building and regulatory community to gain review and acceptance of the concept from those who would use it day-to-day.

In summary, considering the highly-charged nature of the work done by the Center for Fire Research, it is absolutely essential that this work continues within government, and not in the private sector, as this possibility is being proposed by the Administration. It cannot be transplanted effectively; and it cannot be transplanted at all without creating a vacuum in essential independent research and opening a door to judicial challenges.

Further, the locus of the Center for Fire Research within the NBS, and not in some other government agency, is fully justified because of the universal recognition of NBS' scientific stature and because of the beneficial synergistic effects that comparison and correlation with other scientific disciplines in NBS provides. Not one university or private research institution in the United States is able to provide this inter-disciplinary approach.

As we are sure the Subcommittee will realize, the Center's work products not only benefit the NFPA, but also underlie much of the private sector's product certification activities.

To emphasize our point once again, even if the NBS Center for Fire Research could be physically duplicated within the private sector, the credibility of such an entity would be far less than that of the existing NBS organization. Much more can be said on this subject, and we have tried, in an attachment to this statement, to deal briefly with a few of the most important aspects of the question: "What if the CFR is shut down?"

The NFPA also supports fully the work of the NBS Office of Product Standards Policy which, at present, supports private sector standardization initiatives and performs a valuable function in both international and domestic standardization, product certification and accreditation of testing laboratories.

In conclusion, the NFPA urges the Subcommittee on Science, Technology and Space to recommend reauthorization to the NBS, specifically providing for the continuation of the Center for Fire Research at the fiscal year 1983 funding level.

[Attachment]

What If the CFR Is Shut Down?

1. COMBUSTION TOXICITY IS AN ISSUE WHERE THE CFR IS REQUIRED

The tremendous public debate over combustion product toxicity is one in which there is almost no neutral ground. Those responsible for public safety get facts from combustible materials industries on one side, and those who make non-combustible products on the other. While there may be valid points on both sides, regulators are poorly equipped to determine which materials are fact and which are simply self-serving in this complex area. The Center is the only credible source of technical information and, hence, occupies the only neutral ground in a hotly contested arena.

Neither NFPA nor the two largest independent fire testing laboratories have any biological testing capability. Several smaller testing laboratories do, but they are all already trying to sell their particular tests, so it's hard to see who would fill the need for neutrality. Yet, if the laboratory is not funded, near anarchy could result.

2. PRIVATE SECTOR NOT EQUIPPED TO PICK UP WORK OF THE CFR

As part of NBS, the Center for Fire Research's job is to develop methods to measure fire performance and to help decide what level of performance is needed. By contrast, industry provides proprietary products and services. In fire protection, these proprietary products usually must meet specific requirements—requirements that are often set based on work done by the Center. At present, NBS and the private sector do not compete, but perform complimentary functions.

If the Center were to be abolished, the private sector would have to take on the role of umpire where now it is participant in the game, and this raises a potential for severe conflict of interest.

3. OTHER COUNTRIES HAVE NATIONAL FIRE RESEARCH LABORATORIES

Most Western European countries, Canada and Japan have government-supported fire research laboratories. (Even China and The Soviet Union have such organizaitons.) Although input from the private sector is encouraged, in no case is the responsbility for code-related research left in the hands of industry.

4. CENTER SUPPORTS MOST FIRE RESEARCH IN THIS COUNTRY

If funding is halted for the Center, virtually all fundamental research in fire would cease. This is becasuse the Center supports all of the university-based research in the area, as well as its own in-house program.

Therefore, shutting down the CFR shuts down more than an organization—it shuts down an entire area of science.

5. REBUILDING CAPABILITY AT THE CFR IS NOT READILY DONE

In addition to its operating budget, the Center has perhaps $10 million in equipment and facilities, most of it immovable.

If the private sector were to assume the role now played by NBS, NBS would either have to make these facilities avaiable to tenant researchers or the facilities would have to be duplicated elsewhere.

Where testing is routine, private laboratories already duplicate a portion of these facilities and carry out testing on a business basis. For example, Underwriters Laboratories uses a number of CFR-developed tests as part of its listing services.

The development of test methods and criteria involves a breath of staff and facilities that even the largest private labortories do not possess. It is obviously more cost-effective for NBS, using existing laboratory facilities, to continue developing test methods than for several laboratories, independently, each to build such facilities.

Statement of the Society of Fire Protection Engineers

The Society of Fire Protection Engineers (SFPE) is the international technical Society for engineers involved in the multifaceted field of fire protection engineering. Its 3350 members, located primarily in the United States, include engineers in private practice, in industry (automotive, utility, ferrous and non-ferrous metal, petrochemical, petroleum, retailing, etc.), in government (local, regional, and national), in manufacturing and installation of fire protection equipment, as well as technical members of the casualty insurance industry.

The SFPE long range plan includes significant ties to fire research. This fact causes the SFPE deep concern for the potential elimination of the Center for Fire Research (CFR).

The statement of purpose for SFPE is: "to advance the application of engineering principles to protect man and his environment from fire." Two goals of the long range plan based upon that purpose are particularly germane . . . goal 1: "Professional Practice—to advocate the development and application of engineering principles with integrity, objectivity, and technical quality"; and goal 2: "Education—to transfer modern theory, principles, and practice to current and prospective fire protection engineers, allied professionals, and others."

The output of the CFR is in great measure not only used by the fire protection engineer in his daily practice but is a primary factor in the technical advancement of the profession which is to protect life and property from unwanted fire. Three examples will illustrate.

In 1975, a five year program was initiated at the CFR to develop a quantitative evaluation system for grading the fire safety of health care facilities. Users of the system can determine combinations of widely accepted fire safety equipment and building construction features which provide a level of fire safety equivalent to that required by the widely accepted "Life Safety Code" of the National Fire Protection Association (NFPA). The system provides flexibility to both the designer of new facilities and to the renovator of existing health care facilities. Equivalency is judged to exist when the total input of the occupancy risk factors and compensating building fire safety features produce a level of fire safety equal to or greater than that achieved by rigid conformance to the explicit requirements of the NFPA "Life Safety Code." In this evaluation, fire safety performance is guaged both in terms of overall fire safety impact and in the depth of redundance.

This system is in place today and fire protection engineers are using it to evaluate innovative engineering approaches to fire safety in health care facilities, such as those of the Veterans Administration. This effort is continuing and in current development are evaluation systems for apartment buildings, board and care homes, homes for the elderly, prisons and jails, seasonal hotels, and in the future coal mines.

Without the CFR, this pioneer system would not have been developed or would have been delayed. The cost savings resulting from this evaluation technique would not have been realized.

CFR, in a second project important to the fire protection engineer, is developing means to predict the actual burning hazard of furnishings used in a building such as upholstered furniture, desks, tables, chairs, filing cabinets, etc. Hazard is expressed in rate of energy release, smoke development rate, and toxic gas production. This will enable the engineer to predict the total amount of energy and other products of fire likely to be produced within a given room or group of rooms. With this, the engineer can evaluate the total impact of fire on the building occupants and on the structure. Then, rather than arbitrarily condemning a particular furnishing because of its hazard potential, alternative fire safety features can be designed and the total hazard managed.

This breakthrough can be further applied to places of public assembly such as theaters, sports arenas, and schools thus enabling the fire protection to be engineered on the basis of the potential output of an unfriendly fire in the particular structure.

An effort such as this, in all probability, could not have been undertaken by the private sector because it involves such a myriad of industries and special interests . . . man made fabrics, natural fabrics, wood, plastics, steel, aluminum . . . none of which would independently have sufficient incentive to undertake the research.

CFR in another project is applying theories of thermodynamics and fluid mechanics of fire. This effort is providing engineering calculations that can measure or predict fire development without actually having a fire. In the past, it has been necessary to conduct expensive and sometimes inconclusive large and small scale fire tests, to observe working fires or to rely on post fire investigations.

Fire protection engineers need such substantiated theory now in development at the CFR. With the theory discussed above, the engineer could predict the migration of smoke and toxic gases. Given such a prediction, a system could be designed which would assure that occupants of any particular structure could make a timely escape from any potential fire. This work like the previous examples is uniquely peculiar to the mission of the CFR and would not likely be undertaken in the private sector because it is not oriented to a single industry.

Engineering is the application of scientific principles to practical ends such as the design, construction, and operation of efficient and economical structures, equip-

ment, and systems. Fire protection engineers need the CFR so that they may continue to apply "scientific principles" in a manner which produces "practical ends." Those practical ends are the protection of life and property from fire. And according to the NFPA, fire cost America 6,700 civilian deaths and in excess of $6 billion in property damage in 1981. Maintenance of the CFR at $5.89 million or .01 percent of the $6 billion annual loss is appropriate.

SIMCO ELECTRONICS,
Santa Clara, Calif., February 7, 1983.

Senator SLADE GORTON,
Chairman, Senate Science, Technology, and Space Subcommittee, Russell Senate Office Building, Washington, D.C.

DEAR SENATOR GORTON: The field of Measurement Science and dissemination of National Measurement Standards has been a prime responsibility of the National Bureau of Standards.

I wish to protest the recent decision to recover cost for NBS measurement related research from individual user participants in the calibration Measurement Assurance Programs knows as MAP's. These programs, from my perspective, have done more to improve the accuracy level of the National Measurement System than any previous experimental efforts by the Bureau.

The National Measurement System is a web of users of measuring instruments affecting all facets of our daily lives. The measuring instruments used require efficient and state-of-the-art methods and standards to recertify their correct performance and accuracy. With the acceleration of technology, methods in many instances, have become more important to the system than the hardware standards. One of the important methods involves application of Quality Assurance concepts to measurement transfers from the best defined National Type I Standards to the Type II Commericial, Military, and Aerospace calibration laboratories.

These laboratories are not the ultimate recipient of the improved accuracies as they are simply service organizations trying to support the all pervasive web of measurements being made in the National Measurement System.

I am Vice President and Operations Manager of SIMCO, a calibration service company in Santa Clara, California. The company supports the measurements made by over twenty-five thousand instruments owned by our customers. This customer base includes Military and Civil Government Agencies and Laboratories; Manufacturers of Computers; Armament and Consumer Products. The measurement assurance concept has been used in many ways within SIMCO.

SIMCO has participated in a regional voltage MAP for 2 years with good success. In this very competitive small business venture, it would not be practical to consider paying $25,000, instead of the actual processing cost of $600, for the NBS service. In my opinion, many laboratories will reduce the level or frequency of service to avoid any sudden cost increase.

NBS management is also considering across-the-board cost increases for all calibration services as an alternative, which could increase calibration cost 3 to 5 times. As there is no real requirement through laboratory evaluation or accreditation regarding frequency of calibration, I suspect users will extend the interval between NBS calibrations to try and stay within budget. Again, the result would be to reduce the level of service and quality of calibration traceability.

I hold offices in several professional measurement organization such as; President, Precision Measurement Association; Regional Coordinator, National Conference of Standards Laboratories; Director, Precision Measurement Society, and realize we are small groups with what seem to be narrow technical interest.

I wish to advise the Senate that we represent a very pervasive, and not widely understood science of metrology. With very few exceptions, our ranks are filled with dedicated individuals seeking to do the nation a service by constantly improving the accuracy and reliability of measurements.

I am urging consideration of full budget support for the NBS MAP effort, rather than the cost recovery approach in this very important research effort. The budget, as I understand, lists $1.9 million as target for cost recovery. This is a small price to pay for a program development, which offers so much potential to raise the level of understanding by those who perform measurements and calibration.

The National Bureau of Standards has been one of the great national resources since its founding, and should be supported by adequate funding of its research programs. The Bureau's approximately $100 million budget has not kept pace with advancing technology, and, as a result, the Bureau is beginning to fall short in capac-

ity to support the state-of-the-art manufacturing efforts which comprise the last real competitive edge the United States has in the international market.

Please restore to the Bureau the priority required to insure U.S. measurement leadership.

Respectfully submitted,

CARL QUINN, *Vice President.*

FACTORY MUTUAL RESEARCH,
Norwood, Mass., February 10, 1983.

Hon. SLADE GORTON,
U.S. Senate,
Washington, D.C.

SIR: As we understand it, the fiscal 1984 budget proposal to the Congress would eliminate the National Bureau of Standards Center for Fire Research (CFR), a saving of about $6 million, with the expectation that the private sector and possibly state and local governments will increase their support of fire research.

Inasmuch as the group of mutual insurance companies comprising the Factory Mutual System is, through this organization, the principal private-sector supporter of fire research in the nation, our comments may be of interest to you.

Firstly, we believe that the CFR does highly worthwhile work, aimed primarily at the life-threatening aspects of residential fires. Our own internally funded research is aimed primarily at improved protection of industrial and commercial properties ("highly protected risks").

About one-fifth of our research funds are spent for basic fire research studies, the results of which could apply equally well in many cases to either life-threatening residential fires or property-threatening industrial fires. In addition to our own funds, we have had funding, directly or indirectly, from CFR over the past few years sufficient to double our basic fire research activity; that is from a level of about $300k internally funded to about $600k jointly funded annually.

Secondly, our own internal commitment to fire research in 1982 was approximately $1.8 million, but our recently approved 1983 budget will require a 20 percent reduction in this effort. Some personnel are being terminated. Our overall business activity will not support a greater effort level. Hence, if CFR is eliminated we will not be able to pick-up any of the load. Past state and local government funding of fire research does not indicate an ability to absorb the load either.

Thirdly, the basic fire research effort of the nation consists almost entirely of the CFR effort, some university programs supported by CFR, and our own effort. The combined effort is not robust. If CFR disappeared, it is probable that our basic effort would disappear too. What we could fund ourselves would not be viable; the group would be too small to do meaningful work. Such researchers are rare birds. Once they have had to fly elsewhere, getting them back may be impractical, if not, in fact, impossible.

Finally, it is our considered opinion that continued funding of the Center for Fire Research of the National Bureau of Standards at the requested level is fully justified, and in the best interest of society. We strongly urge that funding be approved by the Congress.

Very truly yours,

J. M. RHODES.

NETWORK USERS ASSOCIATION,
Seattle, Wash., February 12, 1983.

Senator SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space,
Russell Senate Office Building, Washington D.C.

DEAR SENATOR GORTON: Congratulations on your recent appointment as head of the Senate Subcommittee on Science, Technology, and Space. As a member of your constituency I was pleased to hear you had assumed that key position.

I am writing you as founder of the Network User's Association (NUA) and current chairman of the NUA's standards committee. The NUA is primarily composed of large corporations from across the country representing many different categories of businesses. The common thread among the members is the use of computer networks as an integral portion of their computer systems.

Computer networks are the glue for the large computer systems of today, and will be the means of interconnecting all computers in the world within the decade. Computer network links into homes will be as common as cable television links are today, and will probably be offered by those same companies as a regular service.

These networks will soon be as important to every home computer user as they are to the large companies in the NUA. The computer network business will be one of the major businesses in this country, and the groundwork for this multi-billion dollar industry is being laid now.

The primary goal of the NUA is the promotion of national and international networking standards. The NUA was founded because of the slow progress of the voluntary standards organizations that were chartered with setting these standards. The standards organizations are primarily composed of companies with business interests in those areas. Users very seldom participate to any great extent because the topics are only incidental to their businesses and it is difficult to cost justify the manpower and travel expenditures involved. By bringing users together we are able to present a common voice to the many standards organizations and assure ourselves of users needs being met without having to directly participate in the groups setting standards.

In our first meeting, held in Seattle in July of 1981, we reviewed the activities of all the major standards setting bodies and unanimously endorsed those efforts of the National Bureau of Standards (NBS) being performed by their Institute of Computer Science and Technology (ICST).

The resolution reads:

"Recognizing:

(1) That the National Bureau of Standards (NBS) is attempting to develop computer-network protocol standards acceptable to major standards organizations worldwide,

(2) That NBS is responsive to the requirements of the private industrial sector as well as federal agencies, and

(3) That versions of the NBS Transport and Session protocols are already undergoing testing:

The Network Users Association (NUA) strongly supports the computer-network protocols standardization efforts of NBS and intends to work with NBS in assuring that the requirements of its members are encompassed in the NBS standards development process. The NUA requests the federal government to continue strong support for the NBS efforts which are of great value to U.S. industry as well as federal agencies. The NUA further requests that vendors implement the NBS computer-network protocol standards as quickly as possible after their finalization."

The resolution speaks for itself, a good number of large scale computer system users are very much in favor of the NBS (ie: ICST) protocols program and want it to continue. I am enclosing a list of the NUA members for the fiscal year that resolution was adopted. I believe you will agree the number and size of the companies interested in these computer network protocols are impressive.

Since the resolution was passed, the ICST efforts have been widely accepted by both manufacturers and voluntary standards organizations, bearing out our belief in the usefulness of those activities. However, the work completed to date is only the tip of the iceberg. There is much more remaining to be done, and without ICST to act as an impartial research laboratory and standards negotiator, I am confident the U.S. standards efforts will return to their previous state of disarray.

The problem facing large scale computer system users in this country is very simple; we must have common protocols to enable our wide assortment of incompatible computing devices to communicate. The reason computer users have selected from a variety of manufacturers is that no one make equipment can answer all the needs of a large company. Unfortunately U.S. manufacturers are prohibited by law from researching and developing common products other than through voluntary standards organizations where a few dissenters can easily stalemate the process. Attempting to develop technical specifications in committees often spawns dissention that leads to deadlock. An outside source for technical development is almost mandatory. Without voluntary standards to use as a guideline, there will be no commonality of products within this country.

European computer companies are not bound by the same laws as the U.S. manufacturers. The European Computer Manufacturers Association (ECMA) is rapidly developing the common protocols the users in this country require. European computer users will soon have the ability to mix and match their computer systems to achieve the capabilities and cost effectiveness they require. The large, multi-national companies of the NUA require the same resources to be price competitive in the world market.

If the ICST program is cut back the following may come to pass:

(1) Progress in the Federal Information Processing Standards (FIPS) dealing with computer networks could come to a halt, eliminating a great potential source of computer cost savings for the federal govenment. The full annual budget for ICST

could easily be lost in just one unnecessary procurement brought about because of the lack of the ability to share resources.

(2) The catalytic effect of ICST in the voluntary standards programs in this country could be lost, with the potential impact of a fragmented U.S. standards effort resulting in Europeans taking the lead in the setting of international standards and quite possibly in the manufacturing of compatible products.

(3) U.S. companies, to be cost competititve here and abroad, may have to purchase computer products from the Europeans and Japanese if U.S. manufacturers do not choose to implement standards oriented to other countries.

Considering the relatively small amount of money involved, cutting the ICST budget now could be an extremely risky business, with long reaching implications. I urge you to consider the potential impact of any such cut, and hope you can see fit to restore the full ICST budget, if not increase it to enable ICST to better prepare itself for the next round of standards efforts.

The ball is now in your court. I realize the difficulty of trying to balance budgets in this era of cost cutting, but any cutbacks in this particular program will only cause greater costs for the federal government, computer network users, and U.S. computer manufacturers.

If I can be of any further assistance in this matter, please let me know. I will be delighted to contribute as much as possible to any effort to restore the ICST budget.

Sincerely,

SHELDON BLAUMAN,
Chairman, NUA Standards Committee.

WOOD HEATING ALLIANCE,
Washington, D.C., February 16, 1983.

Senator SLADE GORTON,
Chairman,
Subcommittee on Science, Technology, and Space,
Committee on Commerce, Science, and Transporation, U.S. Senate, Washington, D.C.

DEAR SENATOR GORTON: The Wood Heating Alliance urges you to restore the budget of the Center for Fire Research in the National Bureau of Standards.

The Wood Heating Alliance is the national trade association of woodstove manufacturers and dealers. We feel strongly that the entire country has benefited greatly from the basic research being conducted by the Center for Fire Research (CFR).

The CFR has been conducting important research into the formation of creosote from solid fuel appliances and into safe techniques for venting solid fuel appliances through combustible walls. The Consumer Product Safety Commission has identified these issues as the chief causes of home fires related to solid fuel appliances. The CFR research is vital to our efforts to improve public safety in the use of these devices.

The woodstove industry is a small and fragmented industry. Hundreds of small manufacturers produce the appliances and none of them have the resources to conduct the needed research in these vital safety areas.

The CFR has done a fine job communicating the results of its research to our indsutry. We expect that our industry will make full use of the CFR research in the new product designs and safety measures.

We hope your Subcommittee will restore the funds in the fiscal year 1984 budget for the CFR research.

Sincerely,

CARTER KEITHLEY,
Executive Director.

AVCO CORP.,
Greenwich, Conn., February 16, 1983.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, Washington, D.C.

DEAR MR. CHAIRMAN: As Chairman of the Statutory Visiting Committee for the National Bureau of Standards, I am taking this opportunity to present the Committee's views on NBS. Besides myself, the Visiting Committee has four members: Dr. Russell G. Meyerand, Jr., Vice President for Research and Development at United Technologies; Dr. Bernard M. Oliver, Vice President (Retired) of Hewlett Packard Company; Dr. Walter H. Stockmayer, Professor of Chemistry at Dartmouth College;

and Dr. Norman F. Ramsey, Higgins Professor of Physics at Harvard University. As you know, the Committee meets twice a year at the Bureau and reports annually to the Secretary of Commerce on its technical activities. In doing so, the Committee benefits greatly from the reports of the evaluation panels chaired by Dr. Mildred S. Desselhaus (Director, Center for Materials Science and Engineering, Massachusetts Institute of Technology). These panels examine the work of the National Measurement and Engineering Laboratories and the Institute for Computer Sciences and Technology and make recommendations to the NBS management.

The Visiting Committee appreciates the commitment that the Reagan Administration has made to reducing the growth in Federal spending and the severe constraints that that commitment has placed on the budget. We have kept this in mind during our review of NBS activities and in our attempt to identify problems that might reasonably be dealt with in this context.

The last meeting of the Visiting Committee was held on Wednesday, February 2, 1983. At that time, the Director of the Bureau of Standards, Dr. Ernest Ambler, reviewed the proposed changes in the 1984 budget with us. The fiscal year 1984 budget provides 25 million dollars or 20 percent less than the base budget of fiscal year 1983. Four hundred and seventy-five positions are in jeopardy—179 are directly tied to programs being eliminated and an additional 296 are vulnerable to overhead reductions and other agency funding.

This severe blow comes at a time when the NBS staff is already lean and just recovering from the disruption of earlier reductions. Over the past two years, the Bureau has reduced its force by 534 people or approximately 15 percent of its staff. The reduction was managed exceptionally well; moral is good, and new initiatives continue to be undertaken through reprogramming. However, cuts of this magnitude have serious long-term consequences. Because the more senior employees have bumping privileges, the Bureau has effectively lost a whole generation of bright young scientists and technicians. A reduction of a further 15 percent at this time would precipitate a major reorganization in the Bureau's management structure and in the use of its facilities. There is no way that this could happen without seriously jeopardizing the ability of NBS to fulfill its mission.

This drastic decrease in the NBS budget is all the more alarming in view of the Administration's proposal to increase the funding of Research and Development (R&D) by 18 percent throughout the government. Thus in a year when the Administration is requesting an increase of 29 percent in R&D for the Department of Defense, 32 percent for the Department of Transportation, and 17 percent for the National Science Foundation, the Department of Commerce is actually requesting a decrease of 28 percent in its R&D budget. The only other agencies or departments requesting substantial reductions in their R&D budgets are the Environmental Protection Agency with a 14 percent decrease and the Department of Interior with 12 percent. Even in the light of the Administration's funding policies, the department of Commerce seems to be way out of line in its support of R&D.

Of the seven areas in which the Bureau is proposing to make major reductions, I have chosen to comment here on two: fire and building research. The Administration argues that these decreases are largely in short term applied research and development, more appropriately the responsibility of the private sector. Let us examine the possibilities for the private sector to undertake the effort in each of the two areas.

The NBS fire program is the only Federal effort aimed at the reduction of annual fire losses of 8,000 lives, 200,000 injuries, and $20 billion in costs. Fires in residences, such as homes, hotels, and care facilities, account for 77 percent of these deaths, 68 percent of the injuries and 46 percent of the dollar losses. The NBS program is the only technical effort in this country directed towards the problem of residential fires. Its results are used by designers, manufacturers, builders, standards writing committees, and State and local code officials.

Except in special cases, the private sector has no incentive to conduct research into fire safety. Fire insurance underwriters deal with the protection of property; since they generally set premiums on an actuarial basis, their profit does not depend on reducing losses. The NBS program is aimed at the protection of life.

In those special cases where the private sector does conduct efforts to reduce fire losses, their activities are usually mission oriented and narrow in scope. As such, they do not overlap with those of the Bureau. NBS does not, for example, engage in technology or development of commercially marketable materials. Nor does NBS do routine tests; product certification is handled by Underwriters Laboratories, Inc. The Factory Mutual Research Corporation, the largest non-government fire laboratory in the country, does indeed address fire protection of industrial buildings and their contents, but industrial fire protection systems are not suitable for residences.

Thus NBS conducts the only comprehensive fire research program in the country. Its program is designed to provide the scientific basis for the prevention and control of all types of fires.

A decade ago, NBS scientists provided basic information on the characteristics and movement of smoke. This information was incorporated into the test procedures used in certifying smoke detectors, which now save 1,000 lives annually. More recently, NBS scientists identified cigarettes as the single largest source of fatal fires. Their work in developing test methods for determining the resistance of mattresses and upholstered furniture to cigarette ignition has the potential of reducing fire fatalities by 20 percent.

In addition to the work carried out on site, NBS is the principal source of support for fundamental fire research throughout the United States, providing annual funding of $1.75 million to about 30 universities. This is consistent with the Administration's policy to derive educational and training advantages from federally supported research. In maintaining these contracts, the Center for Fire Research provides the link between university research and the needs of fire technology.

Improvements in the cost-effectiveness of fire protection systems can have significant economic returns. The construction of new buildings and the rehabilitation of existing buildings runs about $230 billion annually; $7.6 billion is spent on fire safety. Forty percent of this expenditure could be saved by making more informed decisions on the trade-offs between safety, cost, and function. The NBS Fire Safety Evaluation System allows designers to make just such decisions in meeting the requirements of the Life Safety Code. In rehabilitating one hospital, use of NBS guidelines saved $4 million out of an $11 million project; in another hospital, it saved $2 million out of $5 million.

The beneficiaries of the NBS fire research program are the general public. To eliminate this program would be to neglect the Nation's severe fire problem.

The issues associated with the elimination of the Bureau's program in building research are different but equally complex. Construction is one of the Nation's largest industries. In 1981 it amounted to $234 billion or eight percent of the gross national product. Sixty-nine percent of the Nation's wealth is invested in constructed facilities that shelter and support almost all human activities. NBS is the only comprehensive, non-proprietary laboratory dedicated to meeting the measurement requirements of the building community. Its program includes substantial efforts in structural engineering, building materials, building equipment and systems. Authorized by the NBS Organic Act of 1901, the Center for Building Research has led the national effort in building research for 80 years.

There are othe organizations that could be considered to conduct the building research associated with the budget reductions at NBS. But each of these has its own particular skills, facilities and enthusiasms. Not one of them could readily be expanded into an integrated program capable of dealing with the complex technical issues that affect the entire building industry. The Department of Defense, for example, focuses its research programs on problems related to military applications. Many problems of interest to the building community are not included. Several defense laboratories have sponsored research at the Center for Building Technology in order to take advantage of the technical expertise and unique experimental facilities not available elsewhere.

The larger manufacturers of building materials and equipment also conduct research related to building technology. But here the effort focuses on the development of new products. Most of the work is proprietary and does not address the diverse technical problems of the building community. These laboratories could not perform the generic research oriented towards performance that is conducted by NBS.

NBS is the only laboratory capable of investigating the physical causes of major structural failures. It reported on the collapse of the walkway in Kansas City that killed 114 people in 1981, the failure of the overpass in East Chicago that killed 13 construction workers in 1982, and the collapse of the cooling tower at Willow Island that killed 51 construction workers in 1978. Such reports assure that the causes of the disasters are publicly known and can be avoided in the future.

NBS is the major source of non-proprietary information for use by building code officials for revising codes and for determining compliance. This program makes major contributions toward reducing the burden of unnecessary building regulations while maintaining essential levels of safety. For example, NBS, in cooperation with the National Conference of States on Building Codes and Standards, developed a more cost-effective approach to regulating the rehabilitation of buildings. This approach has been adopted by the State of Massachusetts and incorporated in rehabilitation guidelines of the Department of Housing and Urban Development. In still an-

other example, NBS formulated an approach for design standards for energy conservation in buildings. This has been adopted as a national standard by the American Society for Heating, Refrigerating and Air-Conditioning Engineers. It provides the basis for the energy building code of 44 States.

The construction industry is one of the three major disaggregated industries in the country. The other two are health services and food. From a statistical abstract published by the Department of Commerce in 1981, it appears that the health service industry received $4 billion in Federal research support, and the food industry $890 million. The comparable figure for the construction industry is $22 million, all of it at NBS. With over 4 million construction workers and over one million construction firms, the industry simply could not organize itself to conduct this research without Federal support.

I have attempted in this letter to convey to you the seriousness with which the NBS Visiting Committee regards the proposed elimination of the Centers for Fire Research and Building Technology. Every major country in the world has found it necessary to maintain a fire research laboratory in its central government; every developed country in the world has a building research laboratory. I hope the Committee on Science and Technology will give its full support to these two national assets.

Sincerely,

DOROTHY M. SIMON,
Vice President, Research.

NATIONAL INSTITUTE OF BUILDING SCIENCES,
Washington, D.C., February 21, 1983.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space, U.S. Senate, Russell Senate Office Building, Washington, D.C.

DEAR SENATOR GORTON: Thank you for inviting our views on the proposed 1984 budget cuts within the U.S. Department of Commerce involving the Center for Building Technology and the Center for Fire Research within the National Bureau of Standards.

The National Institute of Building Sciences (NIBS) was authorized by Congress in 1974 to become an authoritative national source of information on the use of building science and technology to improve the nation's building regulatory environment and accelerate the introduction and use of new and existing technology into the construction process. A copy of our authorizing legislation, Section 809 of Public Law 93-383, is attached to this letter for your information and reference.

The work conducted by the Center for Building Technology (CBT) and the Center for Fire Research (CFR) has long had an impact on the building community, including the voluntary consensus standards system related to building products and practices. Information and data gathered by CBT and CFR is often used by standards-making organizations as the basis for new and revised building standards. Such standards may, in turn, be referenced by model code groups and regulatory bodies to control the physical properties and/or performance characteristics of products, materials, processes, or services that are incorporated into buildings.

The system for developing building standards in the United States is characterized by two important features: it is largely voluntary and it is highly fragmented and decentralized. These facts reflect the composition of the building community in this country which is comprised of thousands of small businesses and special interest groups. Architects, engineers, builders, product manufacturers, and equipment suppliers—a great many of whom are small and marginally financed—are highly competitive and have limited ability to invest in basic research and development activities. As a result, the development of new technology for the process is slow and what R&D is conducted by the private sector is largely proprietary, somewhat disorganized, and frequently geared to short- or mid-term objectives.

The Center for Building Technology and the Center for Fire Research have been viewed as focal points for building related research and development activities. Both centers, with Federal support, have purchased unique equipment with which to conduct specialized investigations and tests. This has attracted capable personnel. By and large, the building community has derived benefits from the work of CBT and CFR and the elimination of these activities altogether would have a negative impact on the building sector of the economy.

It is the considered opinion of the National Institute of Building Sciences that the Federal government does have a role to play in the stewardship of R&D in the

building sector. The Institute believes that government research should be focused on problems of longer range consequence which may be deemed necessary for the advancement of scientific knowledge. In view of R&D cutbacks in other agencies and departments, serious damage may be done to an industry that is poorly structured to finance basic research and development activities. We urge the Congress to restore appropriate funding to these centers and to adopt the recommendations contained in the attached position statement prepared by the NIBS Board of Directors.

The Institute appreciates this opportunity to assist the subcommittee in its deliberations. Broadly based building community input should be considered by the National Bureau of Standards and by your subcommittee—on a continuing basis—to assure that proper guidance and oversight is being given to the programs within CBT and CFR. The Nation must have the benefit of a greater commitment to public/private cooperation in research, the pursuit of new technology, and the improvement of the quality of life.

Thank you for considering our views.

Sincerly yours,

JASPER S. HAWKINS, *FAIA,*
Chairman of the Board.

Enclosure.

POSITION OF THE NATIONAL INSTITUTE OF BUILDING SCIENCES (NIBS), REGARDING THE FISCAL YEAR 1984 BUDGETS OF THE CENTER FOR BUILDING TECHNOLOGY AND CENTER FOR FIRE RESEARCH

The Department of Commerce has proposed the complete phasing out of the Center for Building Technology (CBT) and the Center for Fire Research (CFR) within the National Bureau of Standards. The National Institute of Building Sciences believes that elimination of these centers would not be wise; rather, the missions and scope of activities of CBT and CFR should be carefully evaluated with respect to the legitimate concerns of the building community.

The United States government already spends less per capita on building research than governments of other developed nations. Less is spent by the Federal government on research in building than in most other industries, despite the fact that construction represents a significant proportion of the Gross National Product and the almost 70% of the nation's wealth is represented by the value of constructed facilities. Of even greater importance is the fact that the fragmented nature of the construction industry makes it extremely difficult for the industry to conduct basic research. Indeed, such research will not be accomplished in the absence of the Federal effort. It is this research that can have meaningful impact on reducing life and property losses due to fire in a nation which leads the world in fire loss, help promote innovative technology, and help prevent deterioration of the infrastructure of out built environment.

Therefore, NIBS urges that CBT and CFR be continued with a sufficient budget to carry out their respective basic research missions. It does so with the caveat that provisions be made for greater industry involvement in the determination of CBT and CFR programs and in the review of the quality and utility of their work, and that these provisions do not involve compliance with the Advisory Committee Act.

The Congress of the United States, in passing Public Law 93-383 in 1974, found that there was need for an authoritative national source to advise both the public and private sectors of the economy with respect to the use of building science and technology. The Congress then established the National Institute of Building Sciences (NIBS) to be that source and called upon NIBS "to assign and delegate—to the maximum extent possible—responsibility for conducting needed activities . . . to one or more of the private organizations, institutions, agencies, and Federal or other governmental entities with a capacity to exercise or contribute to the exercise of such responsibility, monitor the performance achieved through assignment and delegation, and, when deemed necessary, reassign and delegate such responsibility."

In recognition of this charge, the Congress should call upon and provide adequate funds for the National Institute of Building Sciences to evaluate the missions and current programs of CBT and CFR with respect to the research needs of the building community and to make recommendations to the Secretary of Commerce and the Congress as to an appropriate research agenda for these centers.

BOEING COMPUTER SERVICES CO.,
Seattle, Wash., February 21, 1983.

Senator SLADE GORTON,
Russell Senate Office Building,
Washington, D.C.

DEAR SENATOR GORTON: Congratulations on your appointment as head of the Senate Oversight Committee on Commerce, Science, and Technology. The position is extremely important in this era of rapid technology evolution, particularly computing technology. Budgetary allocations made today will shape the way we live and do business tomorrow. The decisions you will be making will greatly affect the ability of U.S. companies to compete in the world market, both directly in computer technology and indirectly in other markets because of the importance of the computer as a tool in all businesses.

One of the many items currently before your committee is the budget for the Institute of Computer Science and Technology (ICST), functioning under the National Bureau of Standards (NBS). The primary role of ICST has been the development of Federal Information Processing Statndards (FIPS). In many respects, the federal government resembles a large company, with the same functional problems as private business. One of these problems is the efficient utilization of computing resources. ICST, through the establishment of FIPS, is helping to solve the problem of efficient utilization of computing resources for the federal government. In doing so they are also leading the way for private industry.

Decreasing the ICST budget will be a case of penny-wise and pound-foolish, for dollars invested in ICST today will be paid back many times over in the near future from cost savings due to greater computer efficiency. We earnestly urge you to dismiss out of hand any effort to decrease the ICST budget, and to consider finding the funds to increase their budget to the level required to keep our heads above water in this age of rapid technological growth.

The attachment details our analysis of the importance of ICST, which will explain our concern with the possible cutback, in ICST funding. If you have any questions regarding computer technology issues affecting decisions on matters before you, please feel free to contact me for a qualified user's view on their significance and bearing on the U.S. economy.

Thank you very much for your consideration of this matter so important to the economy of the U.S. through savings in the federal government computer expenditures, and through the competitive edge it will give U.S. private business.

Sincerely,

R. L. DRYDEN.

Attachment.

THE IMPORTANCE OF ICST IN THE STANDARDS PROCESS

ICST and Boeing Computer Services Company both belong to the American National Standards Institute (ANSI). ANSI is the principal standards setting institution in the U.S., and the U.S. representative in the International Standards Organization (ISO). ICST, like Boeing Computer Services Company, uses ANSI standards when they are available. However, in the world of computer technology, the requirement for standards has outpaced the ability of standards organizations to keep pace. ICST has been able to fill that gap by developing specifications which are consistent with technology trends, are a consensus of approaches to the problems they address, and are generally acceptable to both manufacturers and users alike.

The output of ICST is fed back into the standards process and, in many cases, has become the base for new ANSI and ISO standards. The recently introduced ISO Transport Protocol Specification is a prime example. The transport protocol is a key ingredient in computer communications and, without ICST's input, this key computer software standards progress would have been delayed by many years.

ICST is now serving a key role in encouraging the implementation of Transport Protocol by computer manufacturers. They are also developing specifications for other communication elements and feeding them back into the system just as they did for transport. These efforts not only speed up the standards process, but also assure the U.S. position is clearly defined and is recognized in the international standards arena. Boeing Computer Services Company, like many other major U.S. companies, has always given ICST their full support in this effort and continues to do so.

The standards, ICST is doing so much to develop, are absolutely necessary for large multi-national companies, such as The Boeing Company, to compete in the world market. As you know, The Boeing Company's major competitor in the aircraft

business is Airbus International, which is owned by several European governments. To overcome the political advantage this gives our competitors, we must be as efficient as possible in all areas, and the effective use of computers is an absolute necessity in this highly competitive environment. If ICST were to cease setting the pace for standards development and were unable to encourage early U.S. implementation of those standards, the European manufacturers would rapidly take the lead. This would result in two problems: international standards would not be as oriented to U.S. requirements; and European systems would be implemented earlier than U.S. systems, giving our competitors more sophisticated and cost effective system.

We have watched the Japanese step in and dominate the automotive market, while U.S. manufacturers stood by helplessly, unable to rise to the challenge. This same scene could be replayed in the computing industry, in which the U.S. has only a tenuous lead. Only in this case, the challengers are both the Japanese and the Europeans. U.S. business must have the best in computer technology, and if our manufacturers fall behind in their product offerings, U.S. business will be forced, by economic necessity, to purchase the systems which allow them to compete in a world market.

Our participation in ANSI has given us historical perspective on the ability of the U.S. to develop the standardized computer systems U.S. business requires. Without ICST to act as a catalyst, there is little hope that U.S. manufacturers will be able to supply the integrated resources we require, and that we see being developed in Europe today. Instead of the ICST budget being cut to an amount barely able to pay for the cost of the facility, it should be increased to allow for preparation for the next computer battleground, application software. ICST must begin staffing to research the future problems in this area, such as data management, which is a topic of tremendous importance to the private sector as well as to the federal government.

MINERAL INSULATION MANUFACTURERS ASSOCIATION,
Summit, N.J., March 3, 1983.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space,
U.S. Senate, Washington, D.C.

DEAR SENATOR GORTON: The members of the Mineral Insulation Manufacturers' Association, Inc. (MIMA), whose names are listed below, appreciate the opportunity to comment on the proposed 1984 budget cuts within the U.S. Department of Commerce involving the Center for Building Technology and the Center for Fire Research within the National Bureau of Standards.

The Center for Building Technology is our country's only nonproprietary laboratory which can supply the type of research and development that cannot be obtained from private sources but which can stimulate private sector research as a result of its findings. The Center for Building Technology is the rallying point on insulation products, insulation systems, and thermal testing between industry, NBS, other government agencies, ASTM, ASHRAE, and others.

Of particular importance to our industry in recent years is the provision by The Center for Building Technology of measured calibrated transfer specimens for use in conjunction with the "representative thickness" provisions of the FTC Rule, "Labeling and Advertising of Home Insulation", 16 CFR 460.6. Test data was generated by the 1000 mm line-heat source guarded hot plate; documentation was obtained regarding the test appropriateness and the theory of heat flow in thick insulations. MIMA provided a Research Associate to assist in this development at a cost of $50,000.

This program could not have been accomplished by private industry within the prescribed time limits. One insulation manufacturer with extensive research facilities invested in excess of $600,000 in 1976–1978 in research and development directed toward implementation of full thickness testing. They concluded that they were still not confident that full thickness testing was mature.

The FTC was urged by industry to defer its implementation of the full thickness testing section of its Rule until the NBS 1000 mm guarded hot plate and the related measured calibration transfer specimens were available. It was estimated that, in the fourteen months required to complete this development, manufacturers would be exposed to a rash of civic petitions for non-compliance with the test method then required by the FTC. This test method had already been determined by NBC CBT to be not feasible. Increased costs of industry for this immediate compliance, which would have had to be passed to the consumer, were estimated to be around $90 million for the furteen month period.

Other activities by The Center for Building Technology of importance to the mineral fiber insulation industry:

(a) Thermal wall mass study: an independent evaluation to predict the effect of wall mass on energy use.

(b) Development of thermal test methods for building and insulating materials that will determine their thermal properties as required for cost-effective materials selection and building envelope design. (The Guarded Hot Box).

(c) Development of techniques to assess the airtightness in houses.

(d) Development of diagnostic procedures, measurement techniques, and interpretation methods for in-situ assessment of the thermal integrity of building envelopes.

(e) MIMA was one of the instigators of the NVLAP program relating to insulating products. The Center for Building Technology's inspection of apparatus and standard testing procedures under the program is, again, an important nonproprietary contribution to the establishment of quality assurance for buildings.

MIMA appreciates the opportunity to submit its opinions to the subcommittee. We urge that Congress restore appropriate funding to both the Center for Building Technology and the Center for Fire Research. These elements within our nation's sole national building research laboratory must continue to work on R&D projects to provide the information needed by Federal Agencies interested in building and to provide technology that private industry alone cannot provide.

Thank you for considering our views.

Sincerely yours,

SHELDON H. CADY,
Executive Vice President.

U.S. CHAMBER OF COMMERCE OF AMERICA,
Washington, D.C., March 4, 1983.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Technology, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: On behalf of the 235,000 members of the U.S. Chamber of Commerce, we urge you to reauthorize the Center for Building Technology (CBT) and the Center for Fire Research (CFR). Continuation of both these organizations within the National Bureau of Standards is in the best interest of the entire construction community because they provide unique research capabilities and perspectives which cannot be duplicated in the private sector.

The Center for Building Technology has undertaken a wide range of activities that have resulted in improvements in construction technology and enhanced the operation of the market place to the advantage of both industry and the consumer. Attachment A lists several specific examples of important contributions made by CBT. In addition, we specifically want to note that the U.S. Chamber's Construction Action Council cosponsored a meeting on commercial construction productivity with the CBT which was one of our most successful efforts at public/private partnership.

The need for the Center for Fire Research remains as valid today as when it was established in 1974. The United States continues to lead the industrial world in the number of lives lost to fires and the increasing complexity of buildings and their contents make the need for further research vital. CFR offers unique research facilities that deal with the highly specialized issues involved in fire research. It is extremely unlikely that any private sector institution could or would step in to provide either the equipment or interdisciplinary approach needed to address this problem. Attachment B lists specific examples of the contributions by the Center.

While not part of this authorization bill, we also want to express our continued support for the National Voluntary Laboratory Accreditation Program (NVLAP). An efficient and effective system of testing laboratories is necessary for the practical application of improved product standards. We urge you to support adequate funding for the NVLAP program so that the knowledge produced by organizations such as the Center for Building Technology and the Center for Fire Research can be used in the field.

In summary, we urge you to support reauthorization of the Center for Building Technology and the Center for Fire Research. They have proven records of accomplishments and offer unique facilities and perspectives that cannot be replicated by the private sector.

I will appreciate your consideration of our views and respectfully request inclusion of this letter in the hearing record.

Cordially,

HILTON DAVIS.

Attachment.

ACCOMPLISHMENTS OF THE CENTER FOR BUILDING TECHNOLOGY (CBT)

CBT developed a method for obtaining measured calibrated transfer specimens for use in conjunction with "the representative thickness" provision of the Federal Trade Commission (FTC) Labeling and Advertising of Home Insulation Rule. Test data and documentation were developed by CBT. This could not have been accomplished by private industry within the time limits prescribed by FTC. If the insulation industry had to comply with the FTC rule as written before the development of the guarded hot plate by CBT, increased costs for compliance which would have been passed on to the consumers which were estimated to be approximately $90 million per year.

Conducted comprehensive investigation of 1981 walkway collapse in Kansas City resulting in improved design and construction procedures.

Developed performance criteria and test methods for protection of reinforcing bars in concrete from salt-induced corrosion which will assist in more efficient bridge construction.

At the suggestion of the American Society for Testing and Materials and the American Association of State Highway and Transportation Officials, CBT developed test equipment and procedures so that approximately 580 public and private laboratories across the country could conduct quality assurance testing for building and transportation facilities.

ACCOMPLISHMENTS OF THE CENTER FOR FIRE RESEARCH

The National Bureau of Standards (NBS) Center for Fire Research (CFR) has been the guiding force in the development of testing equipment to quantify characteristics of materials which have been subject to fire. Once these characteristics have been quantified, then a user of a material could rank order materials and make a determination as to the fire hazard that might be associated with the use of various products. Specific examples of standards researched by CFR in this area are:

ASTM Standard E 136 is a frequently used standard to describe combustibility of materials. The furnace used for this evaluation was developed by NBS/CFR.

ASTM Standard E 662 is used to describe the smoke-producing characteristics of a building material. This equipment was developed by NBS/CFR.

ASTM Standards E 162 and E 648 are used to describe flame spread characteristics of building material. Again, NBS/CFR led in the development of the equipment to evaluate these characteristics.

CFR has developed a major program for fire protection methods in high-rise buildings which are vitally needed in light of the MGM Grand Hotel fire in Las Vegas. Specific work has been and is being done on sprinklers, smoke control, smoke detection and building design.

The Center is the principal laboratory for the development of new test methods for flame spread and heat release which are necessary to cope with the very different burning behavior of plastics and other materials.

CFR is the major developer of computer-based fire simulation models needed to estimate the impact of new materials and methods subject to fires.

PORTLAND CEMENT ASSOCIATION,
Washington, D.C., March 8, 1983.

Hon. SLADE GORTON,
Chairman, Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: The Portland Cement Association is the research, promotional and public affairs arm of the cement industry, representing approximately 75% of domestic production capacity.

We wish to express support for FY 1984 funding for the Center for Building Technology within the National Bureau of Standards. In this regard, the Association encourages federal support of those activities of the National Bureau of Standards that are acknowledged to serve the interests of the public but which the cement in-

dustry itself, or others in the private sector, find difficult to justify financially. Partial financial support by NBS of the Cement and Concrete Reference Laboratory is an example of this kind of effort. The CCRL is supported both by NBS and funds provided by the American Society for Testing and Materials, and provides a nationwide inspection service for laboratories that test materials used in all types of concrete construction. Results of these inspections include an improvement in the quality of services provided by participating laboratories and consequent better construction for the public.

A second and related NBS activity is the National Voluntary Laboratory Accreditation Program recently established by the Department of Commerce. This program is devoted, in part, to examining and accrediting laboratories that test concrete for all forms of construction. Federal money is used in developing NVLAP programs but it is hoped that these ultimately will become self-supporting.

In general, the Portland Cement Association favors the creation of incentives that will encourage maximum use of private funds for technological development related to the use of cement and concrete. We believe that federal funds should not be used to duplicate activities for which organizations and qualified personnel already exist in the private sector. To assure the proper identification of projects that cannot be carried out by the cement and concrete industries, we believe that selection of federally supported projects should be made only after study by knowledgeable representatives of both the public and private sectors. Once programs are undertaken by organizations such as NBS, these should be permitted frequent review and, if necessary, modification to assure ultimate acceptance and use of results by the concrete and construction industries.

Respectfully submitted.

CHARLES W. REENE,
Executive Vice President, Washington Affairs.

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ERRATA TO

National Bureau of Standards Authorization

The Senate Commerce, Science, and Transportation Committee hearing "National Bureau of Standards Authorization" was inadvertently not numbered. The correct designation is S. Hrg. 98–7.

S261-20